105th Congress, 1st Session – – – – – – – – – – – – House Document 105–163

SHORELINE EROSION AND STORM DAMAGES AT LAKE WORTH INLET, PALM BEACH HARBOR, FLORIDA

COMMUNICATION

FROM

THE ACTING ASSISTANT SECRETARY (CIVIL WORKS), THE DEPARTMENT OF THE ARMY

TRANSMITTING

A REPORT ON A PROJECT FOR MITIGATION OF SHORELINE EROSION AND STORM DAMAGES CAUSED BY EXISTING FEDERAL NAVIGATION IMPROVEMENTS AT LAKE WORTH INLET, PALM BEACH HARBOR, FLORIDA, PURSUANT TO PUB. L. 104–303, SEC. 101(b)(8)

OCTOBER 31, 1997.—Referred to the Committee on Transportation and Infrastructure and ordered to be printed

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U.S. GOVERNMENT PRINTING OFFICE
45–057 WASHINGTON : 1997

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DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0108

21 OCT 1997

REPLY TO
ATTENTION OF

Honorable Newt Gingrich
Speaker of the House
of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

Section 101(b)(8) of the Water Resources Development Act (WRDA) of 1996, authorized a project for mitigation of shoreline erosion and storm damages caused by existing Federal navigation improvements at Lake Worth Inlet, Palm Beach Harbor, Florida. The Secretary of the Army supports the authorization and plans to implement the project through the normal budget process.

The authorized project is described in the report of the Chief of Engineers dated December 27, 1996, which includes other pertinent reports and comments. These reports are in partial response to Section 104 of Public Law 98-360, dated July 16, 1984, and to a resolution adopted by the House Committee on Public Works and Transportation on August 8, 1984. The authority for the study requested an evaluation of the shoreline erosion problems along the entire coast of Florida. The report of the Chief of Engineers covers only the project for Lake Worth Inlet.

The views of the State of Florida, the Department of the Interior, the Federal Emergency Management Agency, and the Environmental Protection Agency are set forth in the enclosed report.

The existing Federal beach erosion control project for Palm Beach County, Florida, was authorized in 1958. The project included a sand transfer plant at Lake Worth Inlet, which was constructed by non-Federal interests in 1958. Federal participation was limited to a 10-year period, which expired in 1968. Since that time, the operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) of the plant have been a non-Federal responsibility.

The existing sand transfer plant at the Lake Worth Inlet is nearly 40 years old and in poor condition. The design is outdated and plant capacity is insufficient to pass the necessary volumes of sand at a sufficient distance south of the inlet. Currently, sand can only be placed close to the south jetty, and the material is moved by hydraulic forces and wave refraction back towards the inlet.

The plan developed by the Corps of Engineers consists of constructing a new fixed sand transfer plant. Based on May 1995 price levels, the estimated first cost of the new Lake Worth Inlet sand transfer facility is about $3,915,000. The authorized project will mitigate for shoreline damage caused by the existing Palm Beach Harbor navigation project; reduce Federal operation and maintenance costs for the harbor; and reduce non-Federal OMRR&R costs for the existing facility. Fish and wildlife mitigation is not required.

In his report, the Chief of Engineers noted the need for additional information on OMRR&R costs for both the existing and authorized sand transfer plants. In addition, the Chief noted that he had unresolved plan formulation concerns. These concerns relate to the need to conduct additional studies of the amount of shoreline recession attributable to the existing Federal navigation project, and hence the appropriate size or capacity of the sand transfer plant, and to the need for more detailed information on the number and location of the sand discharge pipes. This information will be developed during the preconstruction engineering and design phase of the project. The Chief also noted concerns about the economic justification of the project and cost sharing. Subsequent to the completion of the Chief's report, the Corps has confirmed that the data developed for the feasibility study shows that the project is economically justified and that the recommended cost sharing is appropriate. Prior to construction, Corps Headquarters will reconfirm that the project has been formulated correctly, is economically justified, and that the cost sharing is appropriate.

In accordance with Section 111 of the 1968 Rivers and Harbors Act, as amended by Section 940 of WRDA 86; and with Section 101(c) of WRDA 86, the cost sharing for the initial construction of the authorized Lake Worth Inlet sand transfer plant would be 100 percent Federal. Non-Federal interests would be responsible for providing all lands, easements, rights-of-way and relocation costs associated with construction of the project. In accordance with law, the annual OMRR&R costs would be 100 percent non-Federal. The cost of any betterments to the most economically efficient mitigation plan would be a non-Federal responsibility.

The Office of Management and Budget advises that there is no objection to the submission of this report to the Congress. A copy of its letter is enclosed in the report.

Sincerely,

John Zirschky

John H. Zirschky
Acting Assistant Secretary of the Army
(Civil Works)

Enclosure

COMMENTS OF THE OFFICE OF MANAGEMENT AND BUDGET

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

SEP 30 1997

The Honorable John H. Zirschky
Acting Assistant Secretary of the Army
for Civil Works
Pentagon - Room 2E570
Washington, DC 20310-0103

Dear Dr. Zirschky:

As required by Executive Order 12322, the Office of Management and Budget has completed its review of former Secretary Martin Lancaster's recommendation for the Lake Worth Inlet, Palm Beach Harbor, Florida.

The recommendation for this project in his letter of March 24, 1997, is consistent with the policies and program of the President. The Office of Management and Budget does not object to submission of this report to Congress.

Sincerely,

Kathleen Peroff
Deputy Associate Director
Energy and Science Division

COMMENTS OF THE STATE OF FLORIDA

Department of Environmental Protection

Lawton Chiles
Governor

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Virginia B. Wetherell
Secretary

December 13, 1996

Keri Akers
State Clearinghouse
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100

RE: COE/Final Feasibility Report and Final Environmental Impact Statement (EIS), Coast of Florida Erosion and Storm Effects Study
SAI: FL9608020623CR

Dear Ms. Akers:

The Department of Environmental Protection has completed its review of the referenced feasibility study. Based upon our review, this study is consistent with the Department's statutory authorities in the Florida Coastal Management Program. However, as stated in our previous comments, future activities stemming from this study will require appropriate environmental review and coordination, including individual consistency determinations.

All permitting activities resulting from this report will be conducted in the Tallahassee Bureau of Beaches and Coastal Systems (BBCS) office. This office has played an important role in the preparation of this study, including cooperation with the Corps of Engineers financially, and with work-in-kind on a fifty percent cost share basis. At this stage, BBCS wishes to stress its beach and inlet management objective to bypass sand directly to erosion stressed beaches and avoid placement of material in nearshore berms. The Department will review individual project plans from this and other perspectives as part of subsequent consistency and permit reviews.

There is one recommended change which missed our attention during the draft stage. Page 38, section 93, *Coastal Management Program*, should be updated to read:

> The Florida Coastal Management Program (FCMP) was established under the Coastal Management Act of 1978 (Chapter 380, Part II, Florida Statutes), and received federal approval in 1981. The FCMP is comprised of 23 state statutes and their implementing regulations which are administered by 11 state agencies. Under Florida law, the Department of Community Affairs is the lead agency for program administration, while the Department of Environmental Protection carries out major regulatory responsibilities.

The Department appreciates the opportunity to provide comments on this feasibility report and EIS. If I may be of further assistance, please contact me at (904) 487-2231.

Sincerely,

Jim Wood
Environmental Specialist
Office of Intergovernmental Programs

/jw
cc: Al Devereaux, Bureau of Beaches and Coastal Systems
Fritz Wettstein, Division of Marine Resources

STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS

EMERGENCY MANAGEMENT • HOUSING AND COMMUNITY DEVELOPMENT • RESOURCE PLANNING AND MANAGEMENT

LAWTON CHILES
Governor

December 20, 1996

JAMES F. MURLEY
Secretary

Mr. Robert McIntyre
Department of the Army
Policy Review Branch
Policy Division
Alexandria, Virginia 22315-3861

RE: U.S. Department of Defense - Beach Erosion Control Projects - Feasibility Report - Final Environmental Impact Statement - Coast of Florida Erosion and Storm Effects Study, Region III (Lake Worth Inlet) - Palm Beach, Broward and Dade Counties, Florida
SAI: FL9608020623CR

Dear Mr. McIntyre:

The Florida State Clearinghouse, pursuant to Presidential Executive Order 12372, Gubernatorial Executive Order 95-359, the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended, and the National Environmental Policy Act, 42 U.S.C. §§ 4321, 4331-4335, 4341-4347, as amended, has coordinated a review of the above-referenced project.

The Department of Environmental Protection (DEP) indicates that, as previously stated, future activities stemming from this study will require appropriate environmental review and coordination and individual consistency determinations. The DEP notes an additional recommended change to Page 38, section 93. Please refer to the enclosed DEP comments.

The South Florida Water Management District (SFWMD) notes that its previous comments, regarding the Department of Environmental Protection (DEP) taking the lead in the review of this project, remain current. Please refer to the enclosed SFWMD comments.

Based on the information contained in the final environmental impact statement and the enclosed comments provided by our reviewing agencies, the state has determined that the above-referenced project is consistent with the Florida Coastal Management Program.

Thank you for the opportunity to review this project. If you have any questions regarding this letter, please contact Ms. Keri Akers, Clearinghouse Coordinator, at (904) 922-5438.

Sincerely,

Ralph Cantral, Executive Director
Florida Coastal Management Program

RC/cc

Enclosures

cc: Jim Golden, South Florida Water Management District
Jim Wood, Department of Environmental Protection

COMMENTS OF THE DEPARTMENT OF THE INTERIOR

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

ER 96/0729

DEC 6 1996

Mr. Raleigh H. Leef
Acting Chief, Policy Division
Directorate of Civil Works
ATTN:CECW-AR (SA)
7701 Telegraph Road
Alexandria, VA 22315-3861

Dear Mr. Leef:

We have reviewed the Chief of Engineers Proposed Report and the Environmental Impact Statement (EIS) for the Coast of Florida Erosion and Storm Effects, Region III (Lake Worth Inlet), Palm Beach, Broward, and Dade Counties, Florida. The following comments are offered for your consideration.

GENERAL COMMENTS

As reflected in the EIS at "Response to Comments from the U.S. Department of the Interior, Letter dated September 17, 1996" the Department's Fish and Wildlife Service (FWS) agrees, as previously stated in the Fish and Wildlife Coordination Act report for the Coast of Florida Study, dated September 30, 1994, that the reporting requirements of section 2(b) of the Fish and Wildlife Coordination Act have only been partially fulfilled and that individual section 2(b) reports will be required for each proposed beach nourishment segment in Dade, Broward, and Palm Beach Counties.

Therefore, site-specific biological studies necessary to formulate the views and recommendations of the FWS for the Secretary of the Interior's section 2(b) report to Congress will be appropriately scoped in accordance with the National Transfer Agreement and fully conducted by the FWS. We have no objection to the proposed report of the Chief of Engineers.

SPECIFIC COMMENTS

EIS Summary, Section 1.2, Areas of Controversy

Use of Bahamian Sand for Nourishment Activities in Broward and Dade Counties: The wide-spread use of Bahamian aragonite in Region III should be considered only after thorough testing for potential adverse effects on listed species of sea turtles. As noted in the EIS, few scientific studies have occurred to date concerning the effects of this non-native material on sea turtles. The one study cited in the EIS (Lutz et al. 1993) suggests that the lighter color aragonite material may skew sex ratios of sea turtle hatchlings. The physical, biological, and chemical composition of this material must be completely understood prior to large-scale deposition on native Florida beaches. Further consultation under the Endangered Species Act (ESA) is warranted if the use of Bahamian aragonite is actively pursued.

Impacts on Sea Turtles: For the Broward and Palm Beach County beaches, the FWS estimates the amount of "take" of sea turtles, with implementation of the timing restrictions, nest relocation program and other precautions (identified in the Incidental Take Statement of the FWS's Biological Opinion dated October 24, 1996), at 270 sea turtle eggs rendered inviable annually. Without these precautions, an estimated 27,000 eggs could be taken annually.

Given this, and the fact that beach nourishment projects take several years to implement, the FWS anticipates that re-initiation of section 7 consultation before project implementation may be warranted. The quality and extent of suitable nesting beaches change over time along Florida's dynamic shoreline, as does the number and species composition of sea turtles nesting on these beaches. This "new biological information" needs to be considered prior to the commencement of nourishment activities.

The FWS would also like to stress the importance of the Conservation Recommendations outlined in the Biological Opinion, specifically the restoration/construction of coastal dune habitat at nourishment sites. The coastal dune ecosystem is important for nesting sea turtles, helps stabilize nourished beaches, and provides habitat for other birds and mammals. Many of the beaches in Region III have been bulkheaded and have no dune component.

Section 7(a)(1) directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of listed species. Palm Beach and Broward Counties have active dune restoration programs. The FWS has partnered with these counties and has provided funding through the FWS's Coastal Restoration Program to restore coastal dunes. Therefore, the FWS recommends that the Corps of Engineers actively assist this effort by including the construction of coastal dunes as a project feature during the engineering and design phase for future nourishment projects.

Impacts on Seagrass Beds: The FWS agrees that site-specific surveys during the summer months are needed to map seagrasses potentially affected by increased turbidity and/or direct burial, particularly at the Key Biscayne nourishment site where as much as 70 acres may be affected.

The FWS also agrees with the National Marine Fisheries Service, letter dated August 28, 1996, that it may not be possible to mitigate for seagrass impacts and that out-of-kind mitigation is undesirable, as many of the functions provided by seagrasses cannot be replaced. For this reason, seagrass resources should be thoroughly mapped and nourishment projects should avoid these sensitive areas.

Impacts on Hardgrounds: An estimated 68.9 acres of nearshore hardbottom is predicted to be directly buried by nourishment activities. Additional acreage, nearshore and offshore reef acreage, surrounding the borrow area would be adversely affected by prolonged chronic turbidity and sedimentation. This significant loss to the reef ecosystems remains, quite possibly, the single-most outstanding unresolved issue associated with this EIS. At this time, the location and extent of hardbottom is acknowledged by the Corps to be imprecise. As importantly, the habitat value (extent of hard and soft corals, invertebrate and fish species composition and abundance, etc.) associated with this ecosystem is largely unknown.

For these reasons, as well as meaningful mitigation planning, the FWS will require adequate funding and time to develop project-specific Fish and Wildlife Coordination Act reports for future nourishment activities.

On page 50, it is concluded that no permanent, significant adverse impacts are anticipated for fishes and other motile invertebrates from nourishment activities. This conclusion is not supported by published, peer-reviewed scientific literature. Without a scientifically controlled study consisting of sufficient replicates to support a statistically valid conclusion, it is premature to make this claim.

We appreciate the opportunity to review these documents.

Sincerely,

Willie R. Taylor

Willie R. Taylor, Director
Office of Environmental Policy
and Compliance

COMMENTS OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY

FEDERAL EMERGENCY MANAGEMENT AGENCY
REGION IV
1371 PEACHTREE ST, NE, SUITE 700
ATLANTA GA 30309-3108

November 29, 1996

Policy Review Branch
Policy Division
ATTN: CECW-AR (SA) Mr. Robert McIntyre
Department of the Army
U.S. Army Corps of Engineers
7701 Telegraph Road
Alexandria, Virginia 22315-3861

Dear Mr. Robert McIntyre:

This refers to your letter, dated November 8, 1996, transmitting the Feasibility Report with Final Environmental Impact Statement (EIS) for the Coast of Florida Erosion and Storm Effects Study Region III (Lake Worth Inlet [Sand Transfer Plant]). Based on our review of the report and final EIS, we do not have any comments regarding the project impacts on FEMA programs. Thank you for the opportunity to review and comment on this project.

If possible, I would like to have future correspondence regarding U.S. Army Corps of Engineers-funded projects (within FEMA Region IV: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee) sent directly to me. If you have any questions or need additional information, please contact me at 404/853-4434.

Sincerely,

William R. Straw
Regional Environmental Officer

cc: Rick Mayson
Brent Paul
Mike Polny

COMMENTS OF THE ENVIRONMENTAL PROTECTION AGENCY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
100 ALABAMA STREET, S.W.
ATLANTA, GEORGIA 30303-3104

November 21, 1996

Policy Review Branch
Policy Division
ATTN: CECW-AR (SA)
7701 Telegraph Road
Alexandria, VA 22315-31861

Subject: Final Environmental Impact Statement (DEIS) for the Coast of Florida - Erosion and Storm Effects Study, Region III, Palm Beach, Broward, and Dade Counties, FL

Dear Mr. Sir:

Under the authority of Section 309 of the Clean Air Act and Section 102(2)(C) of the National Environmental Policy Act (NEPA), EPA, Region 4 has reviewed the subject document. This assessment focused on the responses to our original observations; viz., the consequences of an array of projects and alternatives thereof which will attempt to modify natural coastal geomorphic processes on the southeastern coast of Florida. At this time, these actions are limited to the immediate construction of two sand transport facilities at Lake Worth and a widened beach (0.6 mile) at Dania.

While a number of other projects are discussed in some detail, they are not being recommended for authorization. This reflects the current administration's policy of restricting federal participation to those water resource actions having national significance. In the event the remaining projects receive authorization in the future additional NEPA evaluations will be undertaken.

On the basis of our review we have nothing to add to our initial comments. If we can be of further assistance in this matter, Dr. Gerald J. Miller (404-562-9626) will serve as initial point of contact.

Sincerely yours,

Heinz Mueller

Heinz J. Mueller, Chief
Office of Environmental Assessment

LAKE WORTH INLET, PALM BEACH HARBOR, FLORIDA

REPORT OF THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

CECW-PE (10-1-7a) 27 DEC 1996

SUBJECT: Lake Worth Inlet, Florida

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report for the mitigation of shoreline erosion and damages caused by existing navigation improvements at Lake Worth Inlet, Palm Beach Harbor, Florida. It is accompanied by the report of the district and division engineers which includes an environmental impact statement. This report is in partial response to Section 104 of Public Law 98-360 dated 16 July 1984, and a resolution passed by the Committee on Public Works and Transportation of the U.S. House of Representatives on 8 August 1984. The public law and resolution authorized the Secretary of the Army, acting through the Chief of Engineers, to review, in cooperation with the State of Florida, all previously published reports of the Chief of Engineers pertaining to shoreline erosion on the coast of Florida. This review is to determine whether any modifications of the recommendations contained therein are advisable at this time, with particular reference to developing a comprehensive body of knowledge, information, and data on coastal area changes and processes. This report covers only the project for Lake Worth Inlet, Florida. Any other project segments and elements identified in the feasibility report for Region III of the coast of Florida will be covered in future reports of the Chief of Engineers.

2. Section 101(b)(8) of the Water Resources Development Act (WRDA) of 1996, Public Law 104-303, authorizes construction of the project for navigation and shoreline protection for Lake Worth Inlet (Palm Beach Harbor), Florida, at a total cost of $3,915,000. Section 101(b)(8) does not specify the cost sharing for the project. Project authorization for Lake Worth Inlet is subject to completion of a final report of the Chief of Engineers on or before 31 December 1996 and subject to the conditions recommended in that final report. This report constitutes the final report of the Chief of Engineers in response to this legislation.

3. A Federal beach erosion control project for Palm Beach County, Florida, from Lake Worth Inlet to South Lake Worth Inlet was authorized in 1958. The authorization provides for Federal participation in the cost of initial beach restoration and periodic nourishment of 15.6 miles of shoreline on Palm Beach Island and the construction and operation of a sand transfer plant (STP) at Lake Worth Inlet. The project was authorized for non-Federal construction with Federal reimbursement. Implementation of the authorized project has been limited to construction and operation and maintenance of the STP at Lake Worth Inlet. The construction of the Lake Worth Inlet STP was completed by the project sponsor, Palm Beach County, in 1958 at a total cost of $577,000. The Federal share of the initial construction of

the STP project was $111,000, or 19.3 percent. The total cost of plant operation through 1968 was $842,000, and the project sponsor was reimbursed a total of $176,000, or 20.9 percent. In accordance with the authorizing legislation, Federal participation in the operation of the STP expired on 30 June 1968, and operation of the STP since 1968 has been a non-Federal responsibility. The existing STP is nearly 40 years old and is in poor condition. The design is outdated and plant capacity is insufficient to pass the necessary volumes of sand at a sufficient discharge distance south of the inlet. The existing plant places the sand too close to the south jetty, and the material is moved by hydraulic forces and wave refraction toward the inlet.

4. The plan developed by the district engineer consists of constructing a new fixed STP with five 6-inch jet pumps suspended from a pier oriented perpendicular to the shoreline and located north of the inlet to Palm Beach Harbor; a 12-inch pipeline tunneled under the inlet with a bypassing capacity of approximately 160,000 cubic yards per year; one booster pump; and three discharge points located 750, 1,250, and 1,750 feet along the beach south of the south jetty on Palm Beach Island. Based on May 1995 price levels, the estimated first cost of the Lake Worth Inlet project is about $3,915,000. Based on a discount rate of 7.625 percent and a 50-year period of economic analysis, average annual benefits and costs are estimated at $769,100 and $585,700, respectively. The resulting ratio of benefits-to-costs is 1.3. The new Lake Worth Inlet STP will provide mitigation for shoreline damage attributed to the Palm Beach Harbor Federal navigation project, reduce Federal operation and maintenance (O&M) costs, and save non-Federal operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) costs of the existing STP. Fish and wildlife mitigation is not required.

5. Section 111 of the 1968 Rivers and Harbors Act, as amended by Section 940 of the Water Resources Development Act of 1986 (WRDA 86), Public Law 99-662, and Section 101(c) of WRDA 86 specify cost sharing responsibilities for projects to mitigate erosion caused by navigation projects. Costs for implementation of structural and nonstructural measures for the prevention or mitigation of shore damages attributable to Federal navigation works are cost shared in the same proportion as the cost-sharing provisions applicable to the project causing the shore damage. In the case of the Lake Worth Inlet STP, the reporting officers have determined that, based on current conditions, the first cost of $3,915,000 would be 100-percent Federal. There are currently no costs identified for lands required for construction of the new STP. If after further evaluation during detailed design of the project any land requirements are identified, they would be a non-Federal responsibility. The average annual OMRR&R cost of about $200,000 would be a non-Federal responsibility in accordance with Section 101(c) of Public Law 99-662.

6. Washington level review has concluded that the plan developed by the reporting officers is engineeringly and environmentally sound. However, concerns remain as to whether the plan has been properly formulated as the most cost effective means of mitigating for damages

caused by the Federal navigation project. Additionally, due to receipt of information after completion of the final feasibility report and after project authorization regarding OMRR&R costs for both the existing plant and the authorized project, review of the project's economic justification and basis for project cost sharing are required. Accordingly, further studies will be accomplished during the early stages of preconstruction engineering and design.

7. I generally concur in the plan developed by the reporting officers, subject to such modifications as within the discretionary authority of the Chief of Engineers are advisable. Federal implementation of the authorized project is subject to the completion of the studies described in paragraph 6 to ensure that the project is properly formulated for mitigation of shoreline damage attributed to the Palm Beach Harbor Federal navigation project and that the cost sharing is consistent with law and Administration policy. In addition, the non-Federal sponsor must agree to comply with applicable Federal laws and policies and that, subject to modification as a result of the aforementioned studies, it shall be responsible for the following items of local cooperation:

a. Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the construction and operation and maintenance of the project;

b. Provide all improvements required on lands, easements, and rights-of-way to enable the proper disposal of dredged or excavated material associated with the construction, operation, and maintenance of the project. Such improvements may include, but are not necessarily limited to, retaining dikes, wasteweirs, bulkheads, embankments, monitoring features, stilling basins, and dewatering pumps and pipes;

c. Provide during the period of construction a cash contribution in proportion to special or local benefits realized by project construction;

d. For so long as the project remains authorized, operate, maintain, repair, replace, and rehabilitate the completed project, or functional portion of the project, at no cost to the Federal Government, in a manner compatible with the project's authorized purpose and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

e. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor now or hereafter owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project. No completion, operation, maintenance, repair, replacement or rehabilitation by the Federal Government shall relieve the non-Federal sponsor of responsibility to meet the non-Federal sponsor's obligations, or to preclude the Federal Government from pursuing any other remedy at law or equity to ensure faithful performance;

f. Hold and save the United States free from all damages arising from the construction and the operation, maintenance, repair, replacement, and rehabilitation of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors.

g. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

h. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended, 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

i. Assume complete financial responsibility, as between the Federal Government and the non-Federal sponsor for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, or maintenance of the project;

j. As between the Federal Government and the non-Federal sponsor, the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability. To the maximum extent practicable, operate, maintain, repair, replace, and rehabilitate the project in a manner that will not cause liability to arise under CERCLA;

k. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR, Part 24, in acquiring lands, easements, and rights-of-way, required for the construction, operation, and maintenance of the project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

l. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army";

m. Maintain continued public ownership of the publicly owned shore upon which Federal participation is based, and administer such lands for public use during the economic life of the project; and

n. Accomplish all removals determined necessary by the Federal Government other than those removals specifically assigned to the Federal Government.

JOE N. BALLARD
Lieutenant General, USA
Chief of Engineers

REPORT OF THE DISTRICT ENGINEER

LAKE WORTH INLET
(COAST OF FLORIDA EROSION AND STORM EFFECTS, REGION III)
WITH FINAL ENVIRONMENTAL IMPACT STATEMENT

SYLLABUS

1. This report summarizes a cooperative cost shared feasibility study on the beach erosion and storm damage problems of the Atlantic Ocean shoreline of the lower southeast coast of Florida, including Palm Beach, Broward and Dade Counties. Included in this report are the results of planning, engineering, environmental, economic and real estate studies of the area and its shoreline erosion problems over 88 miles of shoreline; and recommendations for modifications of the existing beach erosion control and shore protection projects.

2. The coastal processes and natural resources along Florida's Gulf and Atlantic shoreline are being investigated on a regional basis, instead of a conventional project by project basis. It is expected that by developing/creating regional projects, considerable savings can be realized in the construction and maintenance of existing Federal projects, both for storm damage reduction and navigation. Considerable advances in computer technology within the last decade have resulted in the development of new coastal numerical modeling applications and geographic information systems (GIS). This new technology was utilized in this study. The comprehensive body of knowledge, information and data used has been collected and stored in the GIS database.

3. To effectively manage and support such a comprehensive and extensive study, Florida was divided into five coastal regions based on distinct differences between the areas, such as wave climate, coastal processes, and beach characteristics. The regions are as follows: Region I - panhandle; Region II - peninsular gulf coast to the northern extent of the Keys; Region III - southern east coast; Region IV - central east coast; and Region V - northern east coast (Figure 1). Separate feasibility studies will be conducted, and reports prepared for each region.

4. The first region studied and the focus of this Feasibility Report is Region III. This region includes Dade County from the southern end of Key Biscayne northward through Broward County up to and including Jupiter Inlet in northern Palm Beach County. This region was identified as the first region for study since it is the most densely populated coastal region in Florida.

5. The selected plan consists of three projects, Palm Beach County, Broward County, and Dade County containing 21 project segment elements over 88 miles of shoreline. The projects are as follows:

Palm Beach County Project
1) Jupiter/Carlin segment
2) Juno/Ocean Cay segment
3) Lake Worth Inlet Sand Transfer Plant (STP)
4) North-end Palm Beach Island segment
5) Palm Beach Island segment
6) South-end Palm Beach Island segment
7) South Lake Worth Inlet STP
8) Ocean Ridge segment
9) Delray Beach segment
10) Highland Beach segment
11) Boca Raton segment

Broward County Project
- 12) Deerfield/Hillsboro Beach segment
- 13) Pompano/Lauderdale-by-the-sea segment
- 14) Fort Lauderdale segment
- 15) J.U. Lloyd segment
- 16) Dania segment
- 17) Hollywood/Hallandale segment

Dade County Project
- 18) Golden Beach segment
- 19) Sunny Isles segment
- 20) Bal Harbour/Surfside/Miami Beach segment
- 21) Key Biscayne segment

6. Project summaries listing new projects, existing projects and project mods follow this syllabus. The total first cost to implement these projects is $87,545,000.

7. There are three recommended projects, Dania, Lake Worth Inlet Sand Transfer Plant and South Lake Worth Inlet Sand Transfer Plant with a total first cost of $10,111,000. The Dania and South Lake Worth Inlet STP would provide significant cost savings to future nourishments of existing projects. The Lake Worth Inlet Sand Transfer Plant is recommended as a modification to the Federal navigation project at Palm Beach Harbor. The recommended projects contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch.

8. The Department of the Army Fiscal Year 1996 Civil Works allocations reflect the President's commitment to focus the development of the Nation's water resources on projects and programs which have national significance. The allocations maintain the Federal government's commitments to non-Federal sponsors for phases of work already underway but do not include any requests for new studies, design or construction for shore protection projects. The U.S. Army Corps of Engineers may or may not be allowed to fund plans and specifications and construction for Region III shore protection projects. The Civil Works budgetary objectives for the shore protection program of the Administration are under review, and may change as the Congress reviews the President's Fiscal Year 1998 budget requests and prepares appropriation legislation.

9. Consequently, the recommendations, especially those relating to Federal participation may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. Prior to transmittal to the Congress, the sponsor, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

RECOMMENDED PROJECT SUMMARIES

Project:	Palm Beach Co., FL Shore Protection Project
Segment:	Lake Worth Inlet Sand Transfer Plant
Project Purpose:	Shore Damage Mitigation
Existing/New Project:	New Project
Project Mod/No Mod:	No Modification
Project Length:	0.76 miles
Monument Range:	R-75 to R-78
Segment Design	
No. of Jet Pumps:	5 Six Inch Pumps
Type Transfer Facility:	Shore-Normal Concrete & Timber Pier
Number of Booster Pumps:	1 (One)
Pipe Diameter:	12 inch
Sand Bypassing Capacity:	160,000 Cubic Yards per Year
Number of Outfalls:	3 (Three)
Environmental Impact	
Hardground Impacted:	No Hardgrounds Impacted
Benefits	
Interest Rate:	7.625 Percent
Total Annual Benefits:	$ 769,100
Costs	
Effective Date of Pricing:	5/16/95
First Cost:	$3,914,300
Interest During Construction(IDC):	$ 75,300
Total Investment Cost:	$3,989,700
Yearly O&M:	$ 200,000
Total Average Annual Cost:	$ 585,700
B/C Ratio:	1.3
Net Annual Benefits:	$ 183,400
Recommended Federal Participation:	Limited to Initial Construction
Cost Sharing	
Federal:	100.00%
Non-Federal:	0.00%
Federal Cost, Initial Construction:	$3,989,700
Non-Federal Cost, Initial Construction:	$0
Federal Cost, O&M:	$0
Non-Federal Cost, O&M:	$ 200,000

RECOMMENDED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	South Lake Worth Inlet Sand Transfer Plant
Existing/New Project:	New Project
Project Mod/No Mod:	No Mod
Project Length:	1.13 miles
Monument Range:	R-152-158
Target Bypassing Rate:	120,000 cy
No. of Outfalls:	1

Environmental Impact

Hardground Impacted:	0

Costs

Effective Date of Pricing:	5/16/95
First Cost:	$3,914,345
Interest During Construction (IDC):	$75,326
Investment Cost:	$3,989,671
Yearly O&M:	$55,200
Average Annual Cost:	$385,732

Recommended Federal Participation: 50 years

Cost Sharing

Federal:	12%
Non-Federal:	88%
Total Federal Cost:	$ 469,721
Total Non-Federal Cost:	$3,444,624

RECOMMENDED PROJECT SUMMARIES

Project:	**Broward County, Florida Shore Protection Project**
Segment:	**Dania**
Existing/New Project:	**New Project**
Project Mod/No Mod:	**No mod**
Project Length:	**0.6 miles**
Monument Range:	**R-98-101**
Potential Nearshore Berms:	**No**

Segment Design

Berm Width Extension:	**125 feet**
Berm Height:	**10 feet NGVD**
Equilibrium Toe of Fill (With Advanced Nourishment):	**220 feet**
Foreshore Slope	**1 V to 15 H**
Nearshore Slope	**1 V to 40 H**
Initial Fill Volume (Including Advanced Nour.):	**460,840 cubic yards**
Renourishment Interval:	**6 years**
Renourishment Volume:	**252,500 cubic yards**

Environmental Impact

Hardground Impacted:	**0**
New Beach Created:	**9.1 acres**

Benefits

Interest Rate:	**7.625%**
Total Annual Benefits:	**$ 4,385,000**

Costs

Effective Date of Pricing:	**5/16/95**
Initial Fill and Advanced Nour.:	**$2,282,700**
Interest During Construction (IDC):	**$43,900**
Each Renourishment Cost:	**$180,850**
Renourishments During Proj. Life:	**8**
Average Annual Cost:	**$362,900**

B/C Ratio:	**12.1**
Net Annual Benefits:	**$ 4,022,100**
Recommended Federal Participation:	**50 years**

Cost Sharing

Federal:	**65%**
Non-Federal:	**35%**
Total Federal Cost:	**$ 1,483,755**
Total Non-Federal Cost:	**$798,945**

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	Jupiter/Carlin
Existing/New Project:	Existing
Project Mod/No Mod:	No Mod
Project Length:	1.1 miles
Monument Range:	R-13-19
Potential Nearshore Berms:	No
<u>Segment Design</u>	
Berm Width Extension:	0 feet
Berm Height:	
Equilibrium Toe of Fill (With Advanced Nourisment):	
Foreshore Slope:	
Nearshore Slope:	
Initial Fill Volume (With Advanced Nourishment):	
Renourishment Interval:	7 years
Renourishment Volume:	
<u>Environmental Impact</u>	
Hardground Impacted:	0
New Beach Created:	0
<u>Benefits</u>	
Interest Rate:	7.625 %
Total Annual Benefits:	
<u>Costs</u>	
Effective Date of Pricing:	
Initial Fill and Advanced Nour.:	
Interest During Construction (IDC):	
Each Renourishment Cost:	
Renourishments During Proj. Life:	
Average Annual Cost:	
B/C Ratio:	
Net Annual Benefits:	
Recommended Federal Participation:	50 years
<u>Cost Sharing</u>	
Federal:	
Non-Federal:	
Total Federal Cost:	
Total Non-Federal Cost:	

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	Juno/Ocean Cay
Existing/New Project:	New Project
Project Mod/No Mod:	No Mod
Project Length:	2.75 miles
Monument Range:	R-27-41
Potential Nearshore Berms:	Yes
<u>Segment Design</u>	
Berm Width Extension:	55 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	300 feet
Foreshore Slope:	1 V to 10 H
Nearshore Slope:	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	737,800 cubic yards
Renourishment Interval:	7 years
Renourishment Volume:	240,000 cubic yards
<u>Environmental Impact</u>	
Hardground Impacted:	1.7 acres
New Beach Created:	18.3 acres
<u>Benefits</u>	
Interest Rate:	7.625 %
Total Annual Benefits:	$ 5,198,700
<u>Costs</u>	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$4,236,200
Interest During Construction (IDC):	$81,500
Each Renourishment Cost:	$2,596,800
Renourishments During Proj. Life:	7
Average Annual Cost:	$631,600
B/C Ratio:	8.2
Net Annual Benefits:	$ 5,198,700
Recommended Federal Participation:	50 years
<u>Cost Sharing</u>	
Federal:	44.1%
Non-Federal:	55.9%
Total Federal Cost:	$ 1,904,106
Total Non-Federal Cost:	$ 2,413,594

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	North-end Palm Beach Island
Existing/New Project:	New Project
Project Mod/No Mod:	No Mod
Project Length:	1.95 miles
Monument Range:	R-76-R-85
Potential Nearshore Berms:	No
Segment Design	
Berm Width Extension:	10 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	281 feet
Foreshore Slope:	1 V to 10 H
Nearshore Slope:	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	339,400 cubic yards
Renourishment Interval:	4 years
Renourishment Volume:	239,400 cubic yards
Environmental Impact	
Hardground Impacted:	18.0 acres
New Beach Created:	2.3 acres
Benefits	
Interest Rate:	7.625 %
Total Annual Benefits:	$ 1,240,200
Costs	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$9,387,600
Interest During Construction (IDC):	$153,500
Each Renourishment Cost:	$2,587,500
Renourishments During Proj. Life:	12
Average Annual Cost:	$897,600
B/C Ratio:	1.4
Net Annual Benefits:	$ 342,600
Recommended Federal Participation:	50 years
Cost Sharing	
Federal:	59.40%
Non-Federal:	40.60%
Total Federal Cost:	$ 5,576,234
Total Non-Federal Cost:	$3,811,366

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	Palm Beach Island
Existing/New Project:	New Project
Project Mod/No Mod:	No Mod
Project Length:	3.1 miles
Monument Range:	R-91-R-105
Potential Nearshore Berms:	Yes
<u>Segment Design</u>	
Berm Width Extension:	25 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	455 feet
Foreshore Slope:	1 V to 10 H
Nearshore Slope:	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	1,025,700 cubic yards
Renourishment Interval:	4 years
Renourishment Volume:	372,400 cubic yards
<u>Environmental Impact</u>	
Hardground Impacted:	3.65 acres
New Beach Created:	9.3 acres
<u>Benefits</u>	
Interest Rate:	7.625 %
Total Annual Benefits:	$ 6,595,800
<u>Costs</u>	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$6,572,600
Interest During Construction (IDC):	$126,500
Each Renourishment Cost:	$372,400
Renourishments During Proj. Life:	12
Average Annual Cost:	$1,214,000
B/C Ratio:	5.4
Net Annual Benefits:	$ 5,381,700
Recommended Federal Participation:	50 years
<u>Cost Sharing</u>	
Federal:	32.20%
Non-Federal:	67.80%
Total Federal Cost:	$ 2,116,377
Total Non-Federal Cost:	$4,456,223

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	South-end Palm Beach Island
Existing/New Project:	New Project
Project Mod/No Mod:	No Mod
Project Length:	3.25 miles
Monument Range:	R-116-132
Potential Nearshore Berms:	No
Segment Design	
Berm Width Extension:	35
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	432 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	674,500 cubic yards
Renourishment Interval:	4 years
Renourishment Volume:	425,600 cubic yards
Environmental Impact	
Hardground Impacted:	5.4 acres
New Beach Created:	13.8 acres
Benefits	
Interest Rate:	7.625%
Upland Development:	
Total Annual Benefits:	$ 3,364,700
Costs	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$5,989,100
Interest During Construction (IDC):	$115,300
Each Renourishment Cost:	$4,018,800
Renourishments During Proj. Life:	12
Average Annual Cost:	$1,370,700
B/C Ratio:	2.5
Net Annual Benefits:	1994000
Recommended Federal Participation:	50 years
Cost Sharing	
Federal:	50.70%
Non-Federal:	49.30%
Total Federal Cost:	$ 3,036,474
Total Non-Federal Cost:	$2,952,626

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	Ocean Ridge
Existing/New Project:	Existing
Project Mod/No Mod:	No Mod
Project Length:	1.35 miles
Monument Range:	R-152-159
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	0 feet
Berm Height:	
Equilibrium Toe of Fill (With Advanced Nourishment):	
Foreshore Slope	
Nearshore Slope	
Initial Fill Volume (Including Advanced Nour.):	
Renourishment Interval:	8 years
Renourishment Volume:	

Environmental Impact

Hardground Impacted:	0
New Beach Created:	0

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	

Costs

Effective Date of Pricing:	
Initial Fill and Advanced Nour.:	
Interest During Construction (IDC):	
Each Renourishment Cost:	
Total Project Cost:	
Average Annual Cost:	
B/C Ratio:	
Net Annual Benefits:	
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	
Non-Federal:	
Total Federal Cost:	
Total Non-Federal Cost:	

NED PROJECT SUMMARIES

Project:	
Segment:	Palm Beach County, Florida Shore Protection Project
Existing/New Project:	Delray Beach
Project Mod/No Mod:	Existing
Project Length:	Project Mod
Monument Range:	2.7 miles
Potential Nearshore Berms:	R-175-188
	Yes

Segment Design

Berm Width Extension:	+20 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill	
(With Advanced Nourishment):	+290 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume	
(Including Advanced Nour.):	+155,300 cubic yards
Renourishment Interval:	7 years
Renourishment Volume:	+155,300 cubic yards

Environmental Impact

Hardground Impacted:	0
New Beach Created:	6.5 acres

Benefits

Interest Rate:	7.625 %
Loss of Land:	
Total Annual Benefits:	$ 3,176,000

Costs

Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$565,300
Interest During Construction (IDC):	$10,900
Each Renourishment Cost:	$478,900
Renourishments During Proj. Life:	7
Average Annual Cost:	$109,000

B/C Ratio:	29.1
Net Annual Benefits:	$ 3,067,000
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	57.90%
Non-Federal:	42.10%
Total Federal Cost:	$ 327,309
Total Non-Federal Cost:	$237,991

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	Highland Beach
Existing/New Project:	New Project
Project Mod/No Mod:	No mod
Project Length:	3 miles
Monument Range:	R-188-203.5
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	120 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	450 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	1,765,300 cubic yards
Renourishment Interval:	7 years
Renourishment Volume:	820,280 cubic yards

Environmental Impact

Hardground Impacted:	1.9 acres
New Beach Created:	49.5 acres

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	$ 4,313,700

Costs

Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$7,812,300
Interest During Construction (IDC):	$150,300
Each Renourishment Cost:	$4,721,900
Renourishments During Proj. Life:	7
Average Annual Cost:	$1,157,200

B/C Ratio:	3.7
Net Annual Benefits:	$ 3,156,500
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	60.60%
Non-Federal:	39.40%
Total Federal Cost:	$ 4,734,254
Total Non-Federal Cost:	$3,078,046

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	Boca Raton
Existing/New Project:	Existing
Project Mod/No Mod:	No Mod
Project Length:	1.65 miles
Monument Range:	R-205-213
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	0 feet	
Berm Height:		
Equilibrium Toe of Fill (With Advanced Nourishment):		
Foreshore Slope		
Nearshore Slope		
Initial Fill Volume (Including Advanced Nour.):		
Renourishment Interval:		8
Renourishment Volume:		

Environmental Impact

Hardground Impacted:		0
New Beach Created:		0

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	

Costs

Effective Date of Pricing:
Initial Fill and Advanced Nour.:
Interest During Construction (IDC):
Each Renourishment Cost:
Renourishments During Proj. Life:
Total Project Cost:
Average Annual Cost:

B/C Ratio:	
Net Annual Benefits:	
Recommended Federal Participation:	50 years

Cost Sharing

Federal:
Non-Federal:
Total Federal Cost:
Total Non-Federal Cost:

NED PROJECT SUMMARIES

Project:	Broward County, Florida Shore Protection Project
Segment:	Deerfield Beach/Hillsboro Beach
Existing/New Project:	New Project
Project Mod/No Mod:	No mod
Project Length:	4.4 miles
Monument Range:	R-1-24
Potential Nearshore Berms:	Yes
<u>Segment Design</u>	
Berm Width Extension:	30 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	406 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	1,055,820 cubic yards
Renourishment Interval:	7 years
Renourishment Volume:	309,120 cubic yards
<u>Environmental Impact</u>	
Hardground Impacted:	4.65 acres
New Beach Created:	16.0 acres
<u>Benefits</u>	
Interest Rate:	7.625 %
Total Annual Benefits:	$ 8,219,100
<u>Costs</u>	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$7,136,800
Interest During Construction (IDC):	$137,300
Each Renourishment Cost:	$2,894,600
Renourishments During Proj. Life:	7
Average Annual Cost:	$896,600
B/C Ratio:	9.2
Net Annual Benefits:	$ 7,332,500
Recommended Federal Participation:	50 years
<u>Cost Sharing</u>	
Federal:	40.00%
Non-Federal:	60.00%
Total Federal Cost:	$ 2,854,720
Total Non-Federal Cost:	$4,282,080

NED PROJECT SUMMARIES

Project:	Broward County, Florida Shore Protection Project
Segment:	Pompan/Lauderdale-by-the-Sea
Existing/New Project:	Existing
Project Mod/No Mod:	Project Mod
Project Length:	5.2 miles
Monument Range:	R-24-53
Potential Nearshore Berms:	Yes
<u>Segment Design</u>	
Berm Width Extension:	+35 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	+365 feet
Foreshore Slope	1 V to 20 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	+600,000 cubic yards
Renourishment Interval:	12 years
Renourishment Volume:	+600,000 cubic yards
<u>Environmental Impact</u>	
Hardground Impacted:	12.25 acres
New Beach Created:	22.0 acres
<u>Benefits</u>	
Interest Rate:	7.625 %
Total Annual Benefits:	$ 1,319,600
<u>Costs</u>	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$8,628,300
Interest During Construction (IDC):	$199,200
Each Renourishment Cost:	$2,236,900
Renourishments During Proj. Life:	4
Average Annual Cost:	$810,600
B/C Ratio:	1.6
Net Annual Benefits:	$ 509,000
Recommended Federal Participation:	50 years
<u>Cost Sharing</u>	
Federal:	64.30%
Non-Federal:	35.70%
Total Federal Cost:	$ 5,547,997
Total Non-Federal Cost:	$3,080,303

NED PROJECT SUMMARIES

Project:	Broward County, Florida Shore Protection Project
Segment:	Fort Lauderdale
Existing/New Project:	New Project
Project Mod/No Mod:	No mod
Project Length:	4 miles
Monument Range:	R-53-74
Potential Nearshore Berms:	No
<u>Segment Design</u>	
Berm Width Extension:	25
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	500 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	792,108 cubic yards
Renourishment Interval:	6 years
Renourishment Volume:	355,084 cubic yards
<u>Environmental Impact</u>	
Hardground Impacted:	8.1 acres
New Beach Created:	12.1 acres
<u>Benefits</u>	
Interest Rate:	7.625 %
Total Annual Benefits:	$ 2,055,200
<u>Costs</u>	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$11,886,600
Interest During Construction (IDC):	$228,700
Each Renourishment Cost:	$5,522,900
Renourishments During Proj. Life:	6
Average Annual Cost:	$1,683,400
B/C Ratio:	1.2
Net Annual Benefits:	$ 371,800
Recommended Federal Participation:	50 years
<u>Cost Sharing</u>	
Federal:	55.90%
Non-Federal:	44.10%
Total Federal Cost:	$ 6,644,609
Total Non-Federal Cost:	$5,241,991

NED PROJECT SUMMARIES

Project:	Broward County, Florida Shore Protection Project
Segment:	J.U. Lloyd
Existing/New Project:	Existing
Project Mod/No Mod:	Project Mod
Project Length:	2.3 miles
Monument Range:	R-86-98
Potential Nearshore Berms:	Yes
Segment Design	
Berm Width Extension:	0 feet
Berm Height:	
Equilibrium Toe of Fill (With Advanced Nourishment):	
Foreshore Slope	
Nearshore Slope	
Initial Fill Volume (Including Advanced Nour.):	
Renourishment Interval:	6 years
Renourishment Volume:	
Environmental Impact	
Hardground Impacted:	0
New Beach Created:	0
Benefits	
Interest Rate:	7.625 %
Total Annual Benefits:	
Costs	
Effective Date of Pricing:	
Initial Fill and Advanced Nour.:	
Interest During Construction (IDC):	
Each Renourishment Cost:	
Renourishments During Proj. Life:	
Average Annual Cost:	
B/C Ratio:	
Net Annual Benefits:	
Recommended Federal Participation:	50 years
Cost Sharing	
Federal:	
Non-Federal:	
Total Federal Cost:	
Total Non-Federal Cost:	

NED PROJECT SUMMARIES

Project:	Broward County, Florida Shore Protection Project
Segment:	Hollywood/Hallandale
Existing/New Project:	Existing
Project Mod/No Mod:	Project Mod
Project Length:	4 miles
Monument Range:	R-101-108
Potential Nearshore Berms:	Yes
<u>Segment Design</u>	
Berm Width Extension:	+50 feet
Berm Height:	7 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	+230 feet
Foreshore Slope	1 V to 15 H
Nearshore Slope	1 V to 40 H
Initial Fill Volume (Including Advanced Nour.):	+720,000 cy
Renourishment Interval:	6 years
Renourishment Volume:	+720,000
<u>Environmental Impact</u>	
Hardground Impacted:	0 acres
New Beach Created:	31.8 acres
<u>Benefits</u>	
Interest Rate:	7.625 %
Total Annual Benefits:	$ 992,000
<u>Costs</u>	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$3,567,400
Interest During Construction (IDC):	$68,700
Each Renourishment Cost:	$3,800,200
Renourishments During Proj. Life:	8
Average Annual Cost:	$805,300
B/C Ratio:	1.2
Net Annual Benefits:	$ 186,700
Recommended Federal Participation:	50 years
<u>Cost Sharing</u>	
Federal:	62.50%
Non-Federal:	37.50%
Total Federal Cost:	$ 2,229,625
Total Non-Federal Cost:	$1,337,775

NED PROJECT SUMMARIES

Project:	Dade County, Florida Shore Protection Project
Segment:	Golden Beach
Existing/New Project:	New Project
Project Mod/No Mod:	No mod
Project Length:	1.2 miles
Monument Range:	R-1-7
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	100 feet
Berm Height:	8.2 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	832 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	534,600 cubic yards
Renourishment Interval:	6 years
Renourishment Volume:	223,560 cubic yards

Environmental Impact

Hardground Impacted:	5.25 acres
New Beach Created:	14.5 acres

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	$ 3,683,300

Costs

Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$14,173,500
Interest During Construction (IDC):	$272,700
Each Renourishment Cost:	$5,521,100
Renourishments During Proj. Life:	8
Average Annual Cost:	$1,886,800

B/C Ratio:	2.0
Net Annual Benefits:	$ 1,796,500
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	65.00%
Non-Federal:	35.00%
Total Federal Cost:	$ 9,212,775
Total Non-Federal Cost:	$4,960,725

NED PROJECT SUMMARIES

Project:	Dade County, Florida Shore Protection Project
Segment:	Sunny Isles
Existing/New Project:	Existing
Project Mod/No Mod:	Project Mod
Project Length:	2.65 miles
Monument Range:	R-7-20
Potential Nearshore Berms:	Yes
<u>Segment Design</u>	
Berm Width Extension:	+20 feet
Berm Height:	8.2 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	+200 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	+146,700 cubic yards
Renourishment Interval:	10 years
Renourishment Volume:	+146,700 cubic yards
<u>Environmental Impact</u>	
Hardground Impacted:	0 acres
New Beach Created:	6.4 acres
<u>Benefits</u>	
Interest Rate:	7.625%
Total Annual Benefits:	$ 345,800
<u>Costs</u>	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$2,200,000
Interest During Construction (IDC):	$42,300
Each Renourishment Cost:	$2,200,000
Renourishments During Proj. Life:	5
Average Annual Cost:	$330,000
B/C Ratio:	1.05
Net Annual Benefits:	$ 15,800
Recommended Federal Participation:	50 years
<u>Cost Sharing</u>	
Federal:	38.30%
Non-Federal:	68.70%
Total Federal Cost:	$ 842,600
Total Non-Federal Cost:	$1,357,400

NED PROJECT SUMMARIES

Project:	Dade County, Florida Shore Protection Project
Segment:	Bal Harbour/Surfside/Miami Beach
Existing/New Project:	Existing
Project Mod/No Mod:	No Mod
Project Length:	9.3 miles
Monument Range:	R-27-74
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	0 feet
Berm Height:	
Equilibrium Toe of Fill (With Advanced Nourishment):	
Foreshore Slope	
Nearshore Slope	
Initial Fill Volume (Including Advanced Nour.):	
Renourishment Interval:	3 years
Renourishment Volume:	

Environmental Impact

Hardground Impacted:	0
New Beach Created:	0

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	

Costs

Effective Date of Pricing:	
Initial Fill and Advanced Nour.:	
Interest During Construction (IDC):	
Each Renourishment Cost:	
Renourishments During Proj. Life:	
Average Annual Cost:	

B/C Ratio:	
Net Annual Benefits:	
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	
Non-Federal:	
Total Federal Cost:	
Total Non-Federal Cost:	

NED PROJECT SUMMARIES

Project:	Dade County, Florida Shore Protection Project
Segment:	Key Biscayne
Existing/New Project:	Existing
Project Mod/No Mod:	Project Mod
Project Length:	2.3 miles
Monument Range:	R-101-113
Potential Nearshore Berms:	No
Segment Design	
Berm Width Extension:	+10 feet
Berm Height:	8.2 feet NGVD
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	+106,660 cubic yards
Renourishment Interval:	7 years
Renourishment Volume:	+106,660 cubic yards
Environmental Impact	
Hardground Impacted:	0 acres
New Beach Created:	2.8 acres
Benefits	
Interest Rate:	7.625%
Total Annual Benefits:	$ 65,700
Costs	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$330,000
Interest During Construction (IDC):	$6,350
Each Renourishment Cost:	$330,000
Renourishments During Proj. Life:	7
Total Project Cost:	$2,640,000
Average Annual Cost:	$63,700
B/C Ratio:	1.03
Net Annual Benefits:	$ 2,000
Recommended Federal Participation:	50 years
Cost Sharing	
Federal:	48.9%
Non-Federal:	51.1%
Total Federal Cost:	$ 1,290,960
Total Non-Federal Cost:	$1,349,040

COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY
REGION III - FEASIBILITY REPORT

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FEASIBILITY REPORT

INTRODUCTION

1. This report summarizes a cooperative cost shared feasibility study on the beach erosion and storm damage problems of the Atlantic Ocean shoreline of the lower southeast coast of Florida, including Palm Beach, Broward and Dade Counties. Included in this report are the results of planning, engineering, environmental, economic and real estate studies of the area and its shoreline erosion problems; and recommendations for modifications of the existing beach erosion control and shore protection projects.

Study Authority

2. This study is being conducted in response to Section 104, of Public Law (PL) 98-360, dated July 16, 1984, and a resolution dated August 8, 1984, by the Committee on Public Works and Transportation, of the U.S. House of Representatives which provide for the following:

3. Section 104, PL 98-360. "The Secretary of the Army, acting through the Chief of Engineers, is authorized to review, in cooperation with the State of Florida, its political subdivision, agencies and instrumentalities thereof, all previous published reports of the Chief of Engineers pertaining to shoreline erosion on the entire coast of Florida with a view to determining whether any modifications of the recommendations contained therein are advisable at this time, with particular reference to developing a comprehensive body of knowledge, information, and data on coastal area changes and processes."

4. House Resolution. "Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, that the Secretary of the Army, acting through the Chief of Engineers, in accordance with the provisions of Section 110 of the River and Harbor Act of 1962, is hereby authorized to study, in cooperation with the State of Florida, its political subdivision and agencies and instrumentalities thereof, the entire coast of Florida, including a determination of whether any modifications of the recommendations contained in previously published reports of the Chief of Engineers pertaining to shoreline erosion on the coast of Florida are advisable, and also including the development of a comprehensive body of knowledge, information, and data on coastal area changes and processes for such entire coast."

Purpose and Scope

5. The Federal interest is to reduce Federal expenditures by more efficiently managing the construction, operation and maintenance of Federal shore protection projects and new projects in Florida. The national interest in the study is founded in the existence of over 90 Federal navigation projects and 21 authorized Federal shore protection projects. The navigation projects include all major Florida ports, including 11 deepwater ports, 30 inlets and passes, and over 2,000 miles of navigation channels. Operation and maintenance of the navigation channels for these projects is in excess of $32 million annually. The 21 shore protection projects provide for restoration of 145 miles of shoreline. To date, 73 miles of these projects have been constructed at a cost exceeding $245 million. The Federal share of this cost exceeds $130 million.

6. The state of Florida's interests in the study stem from the state desire to eliminate or reduce the threat of erosion to both developed and undeveloped shorelines. The state program is based on a threefold approach. The first is to participate in the restoration of eroded beaches by funding up to 75 percent of the non-Federal costs for shore protection projects. The second is to regulate unwise development or encroachment of development along the shoreline seaward of the zone of impact from a 100-year storm event. The third is to purchase undeveloped coastal lands for preservation of the natural resources.

7. The coastal processes and natural resources along Florida's Gulf and Atlantic shoreline are being investigated on a regional basis, instead of a conventional project by project basis. It is expected that by developing/creating regional projects, considerable savings can be realized in the construction and maintenance of existing Federal projects, both for storm damage reduction and navigation. Considerable advances in computer technology within the last decade have resulted in the development of new coastal numerical modeling applications and geographic information systems (GIS). This new technology was utilized in this study. The comprehensive body of knowledge, information and data used has been collected and stored in the GIS database.

8. To effectively manage and support such a comprehensive and extensive study, Florida was divided into five coastal regions based on distinct differences between the areas, such as wave climate, coastal processes, and beach characteristics. The regions are as follows: Region I - panhandle; Region II - peninsular gulf coast to the northern extent of the Keys; Region III - southern east coast; Region IV - central east coast; and Region V - northern east coast

(Figure 1). Separate feasibility studies will be conducted, and reports prepared, for each region.

9. The first region studied and the focus of this Feasibility Report is Region III. This region includes Dade County from the southern end of Key Biscayne northward through Broward County up to and including Jupiter Inlet in northern Palm Beach County. This region was identified as the first region for study since it is the most densely populated coastal region in Florida.

10. Florida's 1990 population totaled 12,237,000 of which 5,668,000 or 44 percent live within 10 miles of the coast. Over 31 percent of Florida's population lives in these three counties. Eastern Florida has and will dominate population trends in the southern United States. Florida's population increased by 152 percent between 1960 and 1988. It's population is projected to increase by 226 percent by the year 2010. Dade, Broward, and Palm Beach counties are the three leading counties in the southeastern U.S. in population changes. It is expected that by the year 2010, Dade and Broward Counties will average 1,227 persons per square mile. Region III has the largest local, state and Federal investment in shore protection. Within the 87.9 miles of Region III shoreline (90.6 miles including inlet widths) there are 58 miles of initial beach restoration and 85 miles of periodic nourishment authorized as part of Federal shore protection projects. The Federal Government, in cooperation with the State of Florida and the project sponsors, has constructed approximately 33.4 miles of protective and recreational beach projects in Region III through September, 1993.

11. This document summarizes an assessment of erosion and storm effects on the shoreline of Region III. These studies and investigations have been undertaken as a cooperative effort between the U.S. Army Corps of Engineers (USACE) and the State of Florida Department of Environmental Protection (DEP), formerly the Florida Department of Natural Resources (DNR), the study sponsor.

The Report and Study Process

12. This report presents sufficient technical and economic analyses, environmental coordination and plan formulation to support the recommended project modifications located at the end of the main text. Included within this report are discussion of all existing Federal and non-Federal shore protection and navigation projects within Region III, plan formulation rationale and process, impact assessment of alternative plans, analyses of alternative plans, recommended project modification, implementation

COAST OF FLORIDA STUDY LOCATION MAP

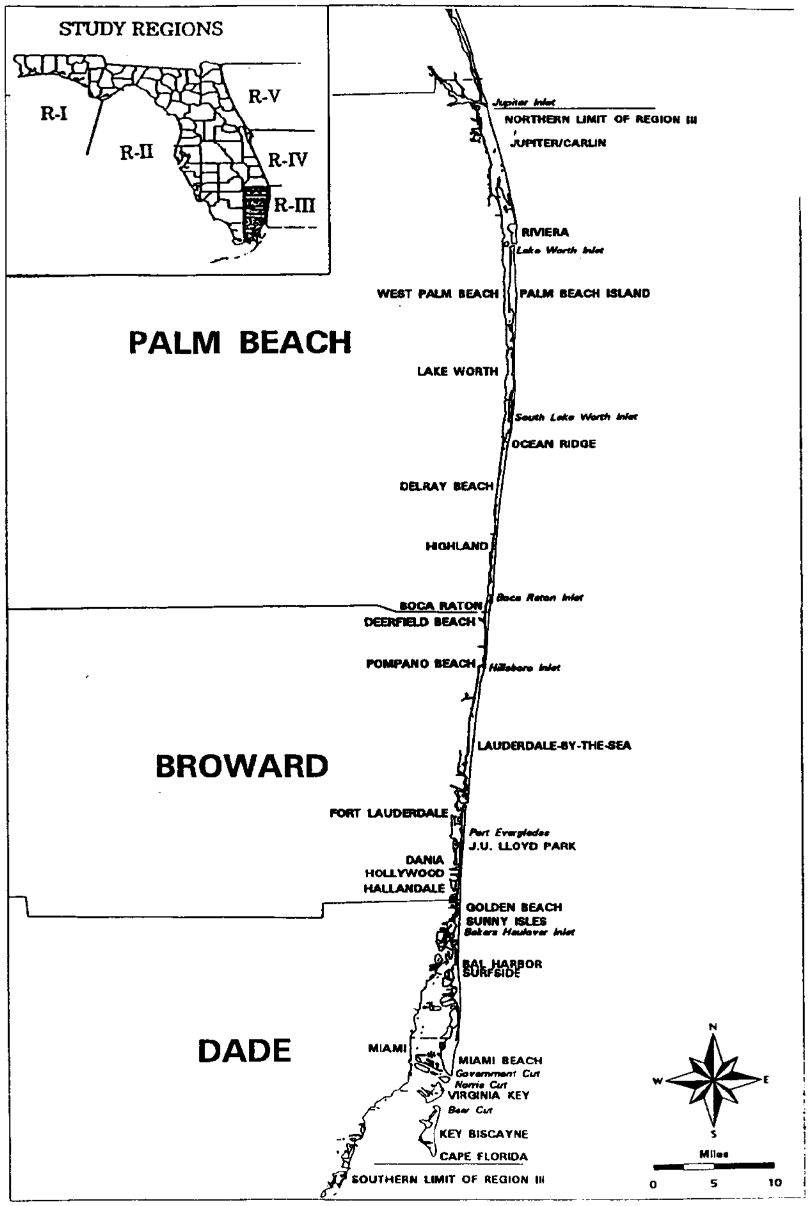

Figure 1

requirements (Federal and non-Federal), coastal engineering and geotechnical analyses.

13. The main report is a general presentation giving the results of the feasibility study for beach erosion and storm damage problems of the Atlantic ocean shoreline of the lower southeast coast of Florida, including Palm Beach, Broward and Dade Counties. It is the basic document presenting a broad view of the overall study and provides a generalized description and discussion of plan components and their functions and interaction. The main report will be submitted to Congress in compliance with the committee resolution authorizing the study.

14. The main text includes a draft Environmental Impact Statement (DEIS) which will be circulated under policies and procedures established for coordinating civil works activities pursuant to the requirements of the Office of Management and Budget's (OMB) Circular A-95 and the Fish and Wildlife Coordination Act. The DEIS is an interim document subject to revisions, and will become final when it is filed with the Environmental Protection Agency after review by the Office of the Chief of Engineers.

15. The eight appendices to the report present supporting data and details covering the features of the feasibility study for Region III as follows:

- Appendix A contains project maps for the existing Federal navigation and shore protection projects in Region III.

- Appendix B contains descriptions of prior reports and corrective actions.

- Appendix C contains pertinent correspondence relevant to this study.

- Appendix D contains engineering investigations, design and cost estimates.

- Appendix E contains geotechnical investigations.

- Appendix F contains the projects economic costs and benefits.

- Appendix G contains the real estate gross appraisal.

- Appendix H contains copies of the existing project cooperation agreements.

- Appendix I contains analysis of nearshore berms.

Study Background

16. The origins of the Coast of Florida Erosion and Storm Effects Study (commonly known as the Coast of Florida Study) can be traced to the University of Florida, Coastal and Oceanographic Engineering Department. In a letter to Jacksonville District dated October 24, 1983. The University transmitted a very general 7-page "Preliminary Program of Investigation, Coastal Sand Budget of Florida", and invited the U.S. Army Corps of Engineers to participate in a related meeting on November 10, 1983. Attendees at this meeting included representatives from the University of Florida, the Florida Department of Natural Resources (DNR), which was latter merged into the Florida Department of Environmental Protection (DEP), the Florida Shore and Beach Preservation Association (FSBPA), and the U.S. Army Corps of Engineers. Corps personnel from the Jacksonville District, the South Atlantic Division, the Coastal Engineering Research Center, and the Directorate of Research and Development in Washington attended.

17. The University of Florida's proposal discussed at the November 10, 1983 meeting comprised three elements: (1) data collection and organization, (2) assessment of data, and (3) application of results to shoreline problems. The document also stated that "the ultimate product [of the study] should enable communities and other agencies to plan and carry out erosion mitigation measures with greater economy and effectiveness than is now possible." Anticipated study roles by various organizations were also outlined. Federal authorization and funding was briefly mentioned by reference to the Coast of California Storm and Tidal Waves Study, a study authorized by the Flood Control Act of 1965. However, the ways and means of obtaining authority and funding for the Coast of Florida Study (COFS) were not clearly defined.

18. In response to considerable Congressional interest in the study, the Office of the Chief of Engineers met with various congressional interests and delegations to discuss possible authorization and funding scenarios. Senator Claude Pepper was instrumental in obtaining the study authorization, with support from the Governor and the DNR. The Director of Civil Works, in a letter dated May 4, 1984, to the Chairman of the House Committee on Public Works and Transportation, assured the committee that the study would be conducted in standard reconnaissance and feasibility phases to "assure greater local participation in planning and lead to an improved success rate, namely construction of projects." Through these efforts, the study authority was authorized on August 8, 1984.

19. The federally funded COFS reconnaissance report was completed in July 1986. The ASA(CW) approved the initiation of feasibility phase studies for the first region of (FCSA) study, Region III on August 14, 1987. The Feasibility Cost Sharing Agreement was signed by the Jacksonville District, U.S. Army Corps of Engineers and the DNR on June 29, 1988. The feasibility study was initiated in August 1988, following receipt of State funds. The cost of the feasibility study is cost shared on an equal 50-50 basis in accordance with Section 105 of the 1986 WRDA.

20. This report summarizes the review of all previously published reports of the Chief of Engineers pertaining to shoreline erosion within Region III as required by the study authority, and explores project modifications. The second purpose of the study was to develop a comprehensive body of knowledge, information, and data on coastal area changes and processes. Previously collected data as well as new specifically collected study data have been incorporated into the developed COFS GIS database. This information will be available to interested agencies or individuals through a central repository operated and maintained by the DEP. The repository is located at Florida State University (FSU). FSU is developing a prototype data retrieval link under contract to the DEP.

Study Area and Location

21. Region III consists of the Atlantic Ocean shoreline of Palm Beach, Broward and Dade Counties, located on Florida's lower southeast coast (Figure 1). Palm Beach County is the northernmost county in Region III, followed by Broward County and then Dade County at the southern end of the region. The northern limit of Region III is Jupiter Inlet and is about 80 miles north of Miami Beach. The northernmost 1.9 mile section of Palm Beach County north of Jupiter Inlet will be examined in detail as part of Region IV efforts, since this reach of beach falls within the St. Lucie to Jupiter Inlet littoral sediment transport zone. Within Region III, Palm Beach County has 42.8 miles of shoreline, Broward County has 23.4 miles and Dade County has 21.7 miles, for a total of about 87.9 miles of Atlantic Ocean shoreline in Region III. The southern limit of the Region III study area is the southern tip of Key Biscayne, the southernmost inhabited coastal barrier island in Dade County.

22. The study area fronts the Atlantic Ocean and is composed of a coastal barrier islands separated from the mainland by various lagoons and bays interconnected by a system of canals and navigation channels maintained as part of the Federal Intracoastal Waterway (ICWW) navigation project from Jacksonville to Miami, Florida. There are a total of ten tidal inlets within Region III which connect the Atlantic Ocean to the inland waters, four of which are federal navigation projects. The inlets are shown in Figure 1. There are eight engineered inlets, both Federal and non-Federal, and two unaltered inlets. The engineered inlets from north to south include Jupiter Inlet, Lake Worth Inlet, South Lake Worth Inlet or Boynton Inlet, Boca Raton Inlet, Hillsboro Inlet, Port Everglades, Bakers Haulover Inlet and Government Cut. The natural inlets are Norris Cut which separates Fisher Island and Virginia Key and Bear Cut which separates Virginia Key and Key Biscayne. The inlets are discussed in greater detail later in this report and in Appendix D (Engineering Appendix).

EXISTING FEDERAL PROJECTS

23. Federal civil works water resource development projects within the Region III shoreline include seven beach erosion control, shore protection and hurricane protection type projects and five navigation projects. Three of the federal navigation projects are deep draft ports. Approximately 33.4 miles of shoreline in Region III have been nourished by placement of 28,648,000 cubic yards of sand at a total cost of $144,454,000, with a Federal contribution of $74,682,000. Approximately 110 miles of federal navigation channels have been constructed, with a total first cost plus operation and maintenance cost of $174,509,000. Project maps for these projects are included in Appendix A. A description of the Federal projects are included in the following paragraphs and in the Engineering Appendix (Appendix D). Table 1 summarizes project data for all Federal storm damage reduction, shore protection and beach erosion control projects in Region III. PCA's associated with these projects are provided in Appendix H. Table 2 summarizes project data for the Federal navigation projects.

Palm Beach County Authorized Shore Protection Projects

24. There are two beach erosion control projects authorized for Palm Beach County. The segment of Palm Beach County from Lake Worth Inlet to South Lake Worth Inlet was authorized in 1958. The segment from the Martin County Line to Lake Worth Inlet and from South Lake Worth Inlet to Broward County Line was authorized in 1962. Palm Beach County is the non-Federal sponsor for each of the primary authorized projects; the Cities of Delray Beach and Boca Raton are sponsors for their respective project segments.

25. Lake Worth Inlet to South Lake Worth Inlet. The beach erosion control project for Lake Worth Inlet to South Lake Worth Inlet, or Palm Beach Island, was authorized in 1958 by PL 85-500. The project, described in House Document (HD)

TABLE 1
SUMMARY DATA
REGION III FEDERAL SHORE PROTECTION PROJECTS
(shit)

Project Name	Year Authorized	Length (miles)	Amount of Fill Placed to Date (1000)(cy)	Cost to Date		
				Federal (1000)($)	Non-Federal (1000)($)	Total (1000)($)
Palm Beach County Lake Worth Inlet (LWI) to South Lake Worth Inlet (SLWI) [1]	1958	15.6	None	648	1,132	1,780
PBC-Martin County Line to LWI and SLWI to Broward County Line [2]	1962	12.8 [3]	4,949 [4]	8,100	8,000	16,100
Broward County	1965	8.9	7,562 [5]	19,100 [6]	19,600	38,700
Dade County	1968 [7]	13.0	15,226	44,000	38,900	82,900
Virginia Key and Key Biscayne [8]	1962	3.7	490	1,700 [9]	826	2,526
Key Biscayne [10]	1985	2.4	421 [11]	1,100	1,300	2,400
Bill Baggs Cape Florida State Recreation Area	1967	N/A [12]	None --------- 28,648 [13]	34 ---------- 74,682	14 ---------- 69,772	48 ----------- 144,454

[1] This project includes construction and operation of a sand transfer plant at LWI. Costs shown are for the construction and operation and maintenance of the sand transfer plant only.
[2] This project includes operation and maintenance of the existing sand transfer plant at SLWI following initial improvement of the project beach. To date, there has been no Federal participation in the sand transfer plant feature of this project.
[3] The project is authorized for 12.8 miles of initial beach fill with nourishment of these shores and other eroding shores throughout the county as needed.
[4] The Boca Raton segment of this project has had 875,000 cy placed and the Delray Beach segment has had 4,074,000 cy placed.
[5] Segment II of this project has had 2,780,000 cy placed and Segment III has had 4,782,000 cy placed.
[6] This amount includes $26,884 for Federal operation and maintenance costs through Oct 1993.
[7] This project was modified by the Water Resources Development Act (WRDA) of 1974, the Supplemental Appropriations Act of 1985 and WRDA of 1986.
[8] This project includes Federal participation in the cost of deferred construction of groins when experience indicated their justification.
[9] This amount includes $1,022 Federal operation and maintenance costs through 30 September 1979.
[10] This project authorization includes construction of a terminal groin at the southern limit of the beach fill and additional toe protection for the revetment at the Cape Florida Lighthouse.
[11] This amount (421,000 cy) represents the beach fill quantity. The stone quantities for the terminal groin construction are as follows: 1,473 tons bedding stone; 1,796 tons core stone; 4,714 tons armor stone and 933 tons toe protection stone.
[12] This project provides for a 283 foot stone revetment.
[13] The stone quantities for construction of the revetment are as follows: 1,150 tons filter and bedding stone and 620 tons armor stone. These quantities do not include the stone that was salvaged from prior corrective action performed by non-Federal interests at the lighthouse.

TABLE 2

SUMMARY DATA FOR REGION III FEDERAL NAVIGATION PROJECTS

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Navigation Project	Earliest Authorization	Channel Length (Miles)	Channel Width (Feet)	Tonnage (1989) 2/ (1993)	Cost to Date 1/ (Sept 1992)	Year of Completion Of Initial Construction
Palm Beach Harbor (Lake Worth Inlet)	July 3, 1930	1.6	300–400	2,519,000 2,816,000	$21,020,925	1967
Port Everglades Harbor	July 3, 1990	1.6	300–500	14,684,700 16,297,000	$56,174,377	1984
Bakers Haulover Inlet	July 14, 1960	1.0	100–200	Unknown	$428,923	1964
Miami Harbor (Government Cut)	July 3, 1930	15.3	200–500	4,492,400 6,696,000	$38,925,199	1975
Intracoastal Waterway (Miami to Jacksonville)	January 21, 1927	370.0	125	536,400 1,029,000	$57,959,482	1965

Total Cost through Sept 1992 = $174,508,906

Total Tonnage for 1989 = 22,232,500 tons

Total Tonnage for 1993 = 26,838,000 tons

1/ Total first cost plus operation and maintenance costs both Federal and Non–Federal.

2/ First number listed is tonnage for 1989. The second number listed is tonnage for 1993. Tonn
increased 21 percent from 1989 to 1993.

342/85/2, provides for Federal participation in the cost of initial restoration and periodic nourishment of 15.6 miles of shoreline on Palm Beach Island and the construction and operation of a sand transfer plant at Lake Worth Inlet. The project is authorized for non-Federal construction with subsequent Federal reimbursement. Project construction to date has been limited to construction and operation of the sand transfer plant at Lake Worth Inlet. The sand transfer plant was completed by non-Federal interests in 1958 at a cost of $577,000. The Federal share was $111,000 (19.3 percent). The total cost of plant operation through 1968 was $842,000. The Federal share was $176,000 (20.9 percent). Federal participation in the operation and maintenance costs of the sand transfer plant expired on 30 June 1968. The operation and maintenance of the sand transfer plant since 1968 has been a non-Federal responsibility. This beach erosion control project is currently inactive.

26. Martin County Line to Lake Worth Inlet and South Lake Worth Inlet to Broward County Line. The beach erosion control project for Martin County Line to Lake Worth Inlet and from South Lake Worth Inlet to Broward County Line, was authorized in 1962 by the River and Harbor Act of 1962 (PL 87-874). The project, described in HD 164/87/1, provides for Federal participation in the cost of initial improvement at four different locations totaling approximately 12.8 miles outside of Palm Beach Island; nourishment of those and other eroding shores as needed throughout the county and operation and maintenance costs of the existing sand transfer plant at South Lake Worth Inlet following initial improvement of the project beach. The project is authorized for non-Federal construction with subsequent Federal reimbursement.

27. Construction has been limited to initial beach fill and periodic nourishment for a 2.65 mile segment at Delray Beach in August 1973; to initial construction of a 1.45 mile segment at Boca Raton in August 1988; and to initial construction of a 1.5 mile beach at Jupiter/Carlin in May, 1995. All were constructed by non-Federal interests with subsequent Federal reimbursement. Federal reimbursement at Jupiter/Carlin is pending. The Delray Beach segment was renourished in 1979, 1984 and 1992 by non-Federal interests with subsequent Federal reimbursement. Total construction costs to date for the Boca Raton segment are $3.5 million ($1.7 million Federal share and $1.8 million non-Federal share). Total construction costs (initial fill and periodic nourishment) for the Delray Beach segment are $12.6 million ($6.4 million Federal share and $6.2 million non-Federal share). Actual construction costs for Jupiter/Carlin and the federal share are awaiting the results of an audit. To

date, there has been no Federal participation in the operation and maintenance costs of the sand transfer plant at South Lake Worth Inlet.

28. The Jupiter/Carlin and Ocean Ridge segments are included in the 1962 authorization. The Ocean Ridge segment consists of 1.5 miles of initial beach fill and periodic nourishment as needed. Preconstruction, engineering and design is being accomplished by Palm Beach County. Initial construction of the Jupiter/Carlin segment was completed in April/May 1995. The Ocean Ridge segment is presently in pre-construction engineering and design.

29. A study to review the Federal interest in the 1958 and 1962 authorized projects was completed in 1987 and is presented in the General Design Memorandum (GDM) for Palm Beach County (USACE, 1987). The purpose of the study was to reformulate the project with current laws and regulations. The GDM recommendations differ from the original authorizations in that the total length of beach fill was reduced from 27.6 miles to 23.7 miles and overall Federal participation increased from 4.35 percent to 39.7 percent.

Broward County Authorized Shore Protection Projects

30. The Broward County and Hillsboro Inlet project, described in HD 91/89/1, was authorized by the River and Harbor Act of 1965 (PL 89-298). The authorization combines beach erosion control, including periodic nourishment, for 8.9 miles of shoreline in Broward County and navigation improvement at Hillsboro Inlet. Three separable project segments were identified in the authorizing document: I) the north Broward County line to Hillsboro Inlet, II) Hillsboro Inlet to Port Everglades Inlet and III) Port Everglades Inlet to the south county line. The navigation features provide for a channel 8 feet deep and 100 feet wide from the ICWW to a point 1,500 feet oceanward in Hillsboro Inlet, thence 10 feet deep and 150 feet wide to deep water in the Atlantic Ocean; jetties on the north and south sides of the ocean entrance; and a permanently based floating dredge to maintain the navigation channel and transfer sand across the inlet with the provision that the dredge be replaced by a trestle-mounted sand transfer plant if the dredge proves to be unsatisfactory. The project is authorized for non-Federal construction with subsequent Federal reimbursement. Broward County is the non-Federal project sponsor.

31. Segment I (Deerfield Beach) has not been constructed. The county initially completed a 3.2 mile project segment at Pompano Beach (Segment II) in 1970. In 1983 the project shoreline was expanded to 5.3 miles to include Lauderdale-

by-the-Sea. The county initially constructed a 1.5 mile beach segment at J.U. Lloyd Park in 1976 (Segment III) and 5.2 miles of beach at Hollywood and Hallandale (the remainder of Segment III) in 1979. The county completed the first nourishment of J.U. Lloyd Park in 1989 and the first nourishment of Hollywood and Hallandale in 1991. All work was performed by the county with subsequent Federal reimbursement. Total construction costs to date for Segment II are $11.8 million ($5.7 million Federal share and $6.1 million non-Federal share). Total construction costs for Segment III are $26.9 million ($13.4 million Federal share and $13.5 million non-Federal share). In addition, Federal operation and maintenance costs through 1993 are $26,884.

32. A re-evaluation study was completed for Segments II and III in April 1994 and October 1990, respectively, under the authority of Section 156 of WRDA of 1976 (PL 94-587), as amended by Section 934 of WRDA of 1986 (PL 99-662). Under this authority, the Assistant Secretary of the Army for Civil Works (ASA(CW)), acting through the Chief of Engineers, was granted discretionary authority to extend Federal participation to the fiftieth year after the date of initial construction of a project. Broward County requested the re-evaluation study be conducted for Segments II and III in September 1990 and February 1988, respectively. In September 1992, the ASA(CW) approved extension of Federal participation in Segment III. A decision by the ASA(CW) on the Section 934 report recommendations for Segment II is pending.

Dade County Authorized Shore Protection Projects

33. There are four authorized shore protection projects in Dade County: 1) the Dade County Beach Erosion Control and Hurricane Protection Project, 2) the Virginia Key and Key Biscayne Beach Erosion Control Project, 3) the Key Biscayne Section 103 project and 4) the Bill Baggs Cape Florida State Recreation Area Shore Protection Project. These projects are discussed below.

34. Dade County Beach Erosion Control and Hurricane Protection Project. The Dade County Beach Erosion Control and Hurricane Protection Project, described in HD 335/90/2, was authorized by the Flood Control Act (FCA) of 1968 (PL 90-483) and modified by the WRDA of 1974 (PL 93-251), the Supplemental Appropriations Act of 1985 and WRDA of 1986 (PL 99-662). Shore protection improvements authorized by the FCA of 1968 provide for 1) beach fill along 1.2 miles of shoreline at Haulover Beach Park, 2) combined beach erosion control and hurricane surge protection fill for 9.3 miles of shoreline between Government Cut and Bakers Haulover Inlet, 3) Federal participation in periodic nourishment of both of the above reaches for the first ten years of project life and 4) credit to non-Federal interests for the pre-project costs of construction for beach fills and groin previously provided by them at Bal Harbour and Haulover Beach Park.

35. Due to advanced erosion, Bal Harbour Village officials completed construction of their 0.85 mile project reach in July 1975. This construction included extension of the south jetty at Bakers Haulover Inlet. Congressional authorization for reimbursement of the Federal share of initial construction costs at Bal Harbour is provided by the Water Resources Development Act of 1974.

36. Construction of the remainder of the Dade County project was initiated in 1977. The first of five contracts was completed August 1978, the second was completed August 1979, the third was completed October 1980, the fourth contract was completed December 1981 and the last contract was completed January 1982.

37. The first Addendum to the Dade County Beach Erosion Control and Hurricane Protection Project GDM was completed in 1981. This addendum recommended raising and sand tightening the north jetty at Government Cut in order to eliminate excessive loss of beach fill material from the project shoreline north of the inlet. These jetty modifications (raising, widening and sand tightening) were completed in 1983.

38. The second Addendum to the Dade County Beach Erosion Control and Hurricane Protection Project GDM was completed in 1984. This addendum was prepared to delineate the work necessary for the first nourishment of the Dade County Beach Erosion Control Project, which included rehabilitation of the north jetty at Bakers Haulover Inlet and extending it about 325 feet. These jetty modifications were completed in 1986. The first nourishment of the Dade County project took place between 1987 and 1990. The majority of the project shoreline was renourished in 1987 and the Bal Harbour segment was renourished in 1990.

39. A subsequent study of the shoreline along the northern part of Dade county (Sunny Isles), completed in 1982, recommended restoration of a protective beach along 2.5 miles of shoreline north of Haulover Beach Park with periodic nourishment as needed. The recommended plan also provided for extension of the period of Federal participation in the cost of nourishing the existing Dade County project from ten years to the life of the project. These modifications to the project were authorized by the Supplemental Appropriations Act of 1985 and the WRDA of 1986. Initial construction of the Sunny Isles project was

completed in 1989. In 1990, additional material was placed at Sunny Isles in conjunction with the Bal Harbour renourishment, discussed above. In 1991, beach quality material from maintenance dredging of the ICWW was placed on the Sunny Isles shoreline.

40. Total construction costs to date, including initial beach fill and periodic nourishments and jetty modifications and rehabilitations for Government Cut and Bakers Haulover Inlet, as discussed above, for the Dade County Beach Erosion Control and Hurricane Protection Project are $82.9 million. The Federal share of these costs is $44.0 million and the non-Federal share is $38.9 million.

41. Hurricane Andrew in August 1992 eroded approximately 475,000 cubic yards of sand from the Dade County project shoreline. Under the authority of PL 84-99, the project is being restored to pre-storm dimensions at Federal expense under two separate contracts (Sunny Isles and Surfside). These contracts are scheduled for completion during 1995 and 1996.

42. Virginia Key and Key Biscayne Beach Erosion Control Project. The Virginia Key and Key Biscayne Beach Erosion Control Project, described in HD 561/87/2, was authorized by the River and Harbor Act of 1962 (PL 87-874). This authorization provided for Federal participation in the cost of periodic nourishment of 1.8 miles of shoreline on Virginia Key and 1.9 miles of shoreline on Key Biscayne for an initial period of ten years and in the cost of deferred construction of groins when experience indicated their justification. Construction was completed in 1969 when approximately 160,000 cubic yards of material was placed on Virginia Key and 130,000 cubic yards of material was placed on Key Biscayne. At the time of project construction, it was determined that approximately 2,000 feet of shoreline located in central Crandon Park on Key Biscayne did not require beach fill as the existing natural beach width in that area approximated the proposed design beach both north and south of this segment. The presence of a large shoal located approximately 650 feet offshore of this area sheltered the beach from wave action thereby allowing for accretion of material at the beach on the leeward side of the shoal.

43. In 1972, the beach at Virginia Key was renourished with 100,000 cubic yards of material dredged for navigation improvements at Government Cut. Thirteen groins were also constructed at that time. Total cost for the Virginia Key and Key Biscayne, Florida Beach Erosion Control Project are $2.5 million ($1.7 million Federal share and $826,000 non-Federal share). In addition, Federal operation and

maintenance costs through 30 September 1979 were $1,022. The project was deauthorized in January 1, 1990 in accordance with Section 1001 of the 1986 WRDA

44. Key Biscayne Beach Erosion Control Project. The Key Biscayne Beach Erosion Control Project was authorized by the Chief of Engineers under the provisions of Section 103 of the 1962 Rivers and Harbor Act in August 1985. It provided for initial beach fill and periodic renourishment of the southern 2.4 miles of shoreline at Key Biscayne between the southern boundary of Crandon Park and the Cape Florida Lighthouse, excluding a 1,600 foot shoreline segment within Bill Baggs Cape Florida State Park. The 1,600 foot reach received no fill due to natural accretion in the area and extensive seagrass beds directly offshore. Also included in the authorized project was construction of a terminal groin at the southern limit of the initial fill, with additional rock to be placed as subtidal habitat and additional toe protection for the revetment at the Cape Florida Lighthouse. Construction of the beach fill and groin was completed in 1987 at a total cost of $2,400,000 ($1,100,000 Federal share and $1,300,000 non-Federal share). Of this total amount, the terminal groin cost was $743,000 ($520,000 Federal share and $223,000 non-Federal share) and the beach fill cost was $1,700,000 ($574,000 Federal share and $1,100,000 non-Federal share).

45. In August 1992, Hurricane Andrew displaced approximately 390 tons of armor stone and 280 tons of foundation stone from the terminal groin. Under the authority of PL 84-99, the groin has been rehabilitated at Federal expense. This work was completed in August 1994 at a total project cost, including planning, preconstruction, engineering, design and construction, of $84,500.

46. Bill Baggs Cape Florida State Recreation Area. Bill Baggs Cape Florida State Recreation Area (formerly called the Cape Florida State Park) is a fully developed recreation area which occupies the southerly 1.2 miles of Key Biscayne. In 1966, state park officials requested an investigation under small projects authority to determine remedial measures needed to stop shoreline recession due to ambient erosion and to prevent undermining and storm damage to the historic lighthouse at the southerly end of Key Biscayne. The study was subsequently completed and the Cape Florida State Park Beach Erosion Control Project was approved on 21 June 1967 by the Chief of Engineers under the provisions of Section 103 of PL 87-874. The authority provided for Federal participation in the initial construction costs of a 283 foot stone revetment. Under existing law, Federal participation is limited to initial construction of the structure. Non-Federal interests are required to maintain

the revetment. The revetment was completed in 1968 at a total construction cost of $48,000 ($34,000 Federal share and $14,000 non-Federal share).

47. In August 1992, Hurricane Andrew partially damaged the revetment protecting the Cape Florida Lighthouse. Under the authority of PL 84-99, the revetment has been rehabilitated at Federal expense. This work was completed in December 1993 at a total project cost, including planning, preconstruction, engineering, design and construction, of $72,000

48. The estimated cost of the remaining nourishment of the previously restored beaches in Region III for the remaining economic life of each Federal shore protection project is shown in Table 3. The year of expiration of Federal participation in each project is also listed. One new start project segment, Jupiter/Carlin, was approved for construction in 1995, and is shown in Table 4. Federal participation in this project segment is limited to 10 years following completion of construction. Two project segments are in preconstruction, engineering and design, and are listed in Table 5. Authorized projects which have not been funded for construction are listed in Table 6. These projects total $571 million in construction costs. One shore protection project in Region III, the Virginia Key/Key Biscayne project, has been completed, and was deauthorized under the provisions of the 1986 Water Resources Development Act, as shown in Table 7.

Authorized Federal Navigation Projects

49. There are five authorized Federal navigation projects within Region III. Project maps for these Federal projects are included in Appendix A. A summary of these Federal projects are included in the following paragraphs. A detailed description of the projects is contained in the Engineering Appendix (Appendix D). Figure 2 provides the location of the Federal navigation projects as well as the three non-Federal navigation projects which are located in Region III. Table 2 summarized pertinent data for the Federal navigation projects.

50. Bakers Haulover Inlet. Bakers Haulover Inlet connects the upper end of Biscayne Bay and the Intracoastal Waterway with the Atlantic Ocean. It is located about 9 miles north of the entrance to Miami Harbor and is used primarily by recreational craft. The project provides for jetties north and south of the entrance channel, to help maintain the project depth in the entrance channel and reduce maintenance costs. It also provides for dredging, when necessary, a

TABLE 3
CONTINUING CONSTRUCTION PROJECTS

Project	Year Expiration	Remaining Project Costs (Oct 1993)
Palm Beach County, FL (62) (Delray Beach Segment)	2023	$20,556,000
(Boca Raton Segment) 1/	1998	$4,243,000
Broward County, FL (Segment III)	2028	$62,585,000
Dade County, FL	2039	$144,967,000
	Total	$232,351,000

1/ Project is limited to 10 years Federal participation. Nourishment costs beyond the period of Federal participation are $21,215,000 for years 11 to 50.

TABLE 4
APPROVED NEW START PROJECTS

Project	Year Expiration	Remaining Project Costs (Oct 1993)
Palm Beach County, FL (62) 1/ (Jupiter Carlin Segment)	2005	$7,143,000

1/ Project is limited to 10 years Federal participation. Nourishment costs beyond the period of Federal participation are $22,367,000 for years 11 to 50.

TABLE 5
PROJECTS IN PRECONSTRUCTION, ENGINEERING AND DESIGN

Project	Year Expiration	Remaining Project Costs (Oct 1993)
Palm Beach County, FL (62) Ocean Ridge – See next table		
Broward County, FL (Segment II)	2020 1/	$129,827,000

1/ Federal Participation expired in 1985. A Section 934 Report is under Department of Army review. The economic life of the project ends in 2020.

TABLE 6
AUTHORIZED BUT NOT FUNDED PROJECTS

Project	Year Expiration	Remaining Project Costs (Oct 1993)
Palm Beach County, FL (62) 1/		$454,552,000
Palm Beach County, FL (58) M/ (45%)		$32,124,000
Broward County, FL (Segment I)		$46,200,000
Key Biscayne, FL (Section 103)	2037 2/	$38,196,000
	Total	$571,072,000

1/ Includes remaining nourishment costs beyond the 10 year period of Federal participation of $21,245,000 for the Boca Raton segment, and $22,367,000 for the Jupiter Carlin segment. It also includes the Ocean Ridge segment. PED for Ocean Ridge segment is underway, and is being funded and performed by the non–Federal sponsor.

2/ Federal limitation under Section 103 authority ($1 million) has been met. This study may recommend additional Federal participation for future nourishments.

M/ = Mitigation is included in project by increasing Federal share of project construction. About 45 percent of the erosion for the north end of the Palm Beach County (58) project is caused by the Palm Beach Harbor Federal navigation project at Lake Worth Inlet.

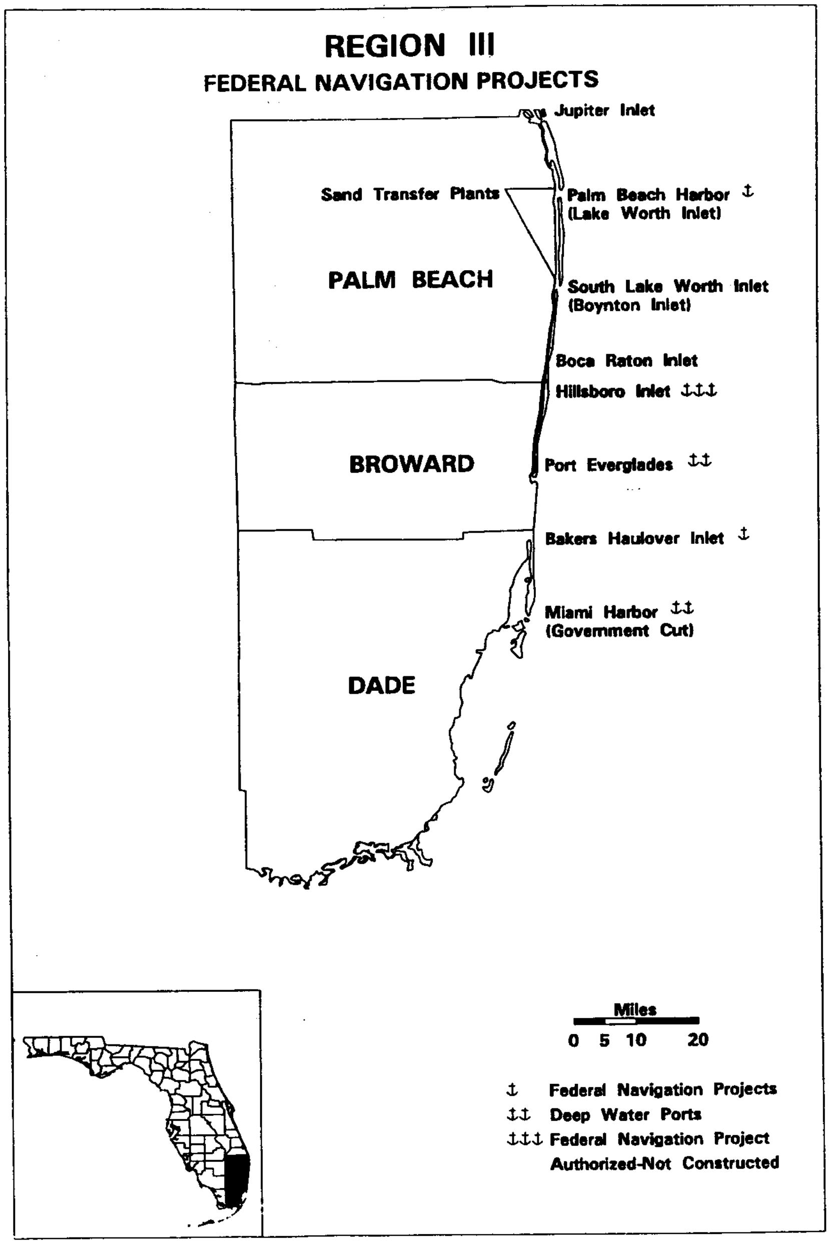
TABLE 7
DEAUTHORIZED PROJECTS

Project	Year Expiration	Remaining Project Costs (Oct 1993)
Virginia Key/Key Biscayne 1/	2019 2/	$7,332,000

1/ This project has been completed, and was deauthorized under the provisions of the 1986 Water Resources Development Act.

2/ The project was completed in 1969. The economic life of the project ends in the year 2019. Federal participation, which was limited to 10 years following completion of construction, expired in 1979.

FIGURE 2


REGION III
FEDERAL NAVIGATION PROJECTS
Jupiter Inlet
Sand Transfer Plants
Palm Beach Harbor ⚓
(Lake Worth Inlet)
PALM BEACH
South Lake Worth Inlet
(Boynton Inlet)
Boca Raton Inlet
Hillsboro Inlet ⚓⚓⚓
BROWARD
Port Everglades ⚓⚓
Bakers Haulover Inlet ⚓
Miami Harbor ⚓⚓
(Government Cut)
DADE
Miles
0 5 10 20
⚓ Federal Navigation Projects
⚓⚓ Deep Water Ports
⚓⚓⚓ Federal Navigation Project
Authorized-Not Constructed

channel 11 feet deep and 200 feet wide through the 300-foot section of the inlet, thence 8 feet deep and 100 feet wide west and north to and including a marina basin 200 feet wide and thence 8 feet deep and 100 feet wide both west and north to the Intracoastal Waterway.

51. The project was completed in December 1964. Periodic surveys of the Intracoastal Waterway indicate some shoaling has occurred.

52. Intracoastal Waterway, Jacksonville to Miami. The Intracoastal Waterway from Jacksonville to Miami is a major segment of the federal inland waterway system which serves both commercial barges and recreational boats. In addition to maintenance of the waterway and side channels, the U.S. Army Corps of Engineers has maintenance responsibility for the bridge which spans the waterway at Palm Valley in St. Johns County. The existing project was completed in 1965. The 1993 traffic was 1,029,000 tons.

53. Miami Harbor. The Miami Harbor project is actually interrelated projects: the main ship channel adjacent to Miami port facilities on Dodge Island serves cruise ships and deep draft commercial ships; the channels in and adjacent to Miami River serve small commercial ships, recreational boats and commercial barges. The 15.3 miles authorized by the project consist of 7.7 miles in the main ship channel, 5.8 miles in Miami River, and 1.8 miles of connecting channels. The main ship channel is protected by jetties north and south of it, and has a turning basin 1,700 feet long and 1,650 feet wide adjacent to Biscayne Boulevard. The main channel serves a large number of cruise ships, making Miami the recognized leader for Caribbean cruises. The actual dredging of Miami Harbor to its authorized 38- and 36-foot depth is now complete.

54. The Water Resources Development Act of 1990 authorized modification of the Miami Harbor project to provide for deepening the Outer Bar cut, the Bar Cut and Government Cut to 44 feet. The new Fishermans Channel and Lummus Island turning basin would be deepened to 42 feet. Fishermans Channel would be constructed to a width of 400 feet and the Lummus Island turning basin would be 1,600 feet in diameter. The Corps' Waterways Experiment Station conducted a ship simulator study to verify the recommended improvements. Under the Corps' recommended plan, all dredged material would be placed in an EPA-approved offshore disposal site. With non-federal sponsor concurrence, the project was identified as a candidate project meeting the criteria of Section 404 of WRDA 90, where non-federal interests can construct the federally authorized project, or a portion thereof, to demonstrate the benefits of such action. The non-federal sponsor submitted a formal proposal to proceed with the entire project under Section 404 by constructing the channel and turning basin with two separate contracts. An agreement for this action was signed November 1, 1991, and the sponsor is proceeding with the construction. The first phase, which entails upland disposal, was completed July 15, 1993. The traffic was 6,696,000 tons in 1993.

55. Lake Worth Inlet (Palm Beach Harbor). The project consists of a channel from the Atlantic Ocean through Lake Worth Inlet, then across Lake Worth and terminating with a turning basin in front of the port of Palm Beach. The project serves commercial and recreational craft.

56. The existing project was completed in 1967, with maintenance authorized for a locally provided turning basin to a depth of 24 feet in 1986. The 1993 traffic was 2,816,000 tons.

57. Port Everglades Harbor. The present Port Everglades Harbor project provides for a channel 45 feet deep and 500 feet wide through the ocean bar, tapering to 450 feet wide and 42 feet deep between the rubblestone entrance jetties, and continuing at those dimensions to an irregularly flared entrance and a turning basin of the same depth, and maintenance of the entrance jetties. Widening of the entrance channel required the removal of a portion of the existing north jetty. The authorized project will also provide a 36-foot depth in front of Berth 18 in the north-south extension of the inner harbor and turning basin. The remainder of the extension will keep its present 31-foot depth. A channel extension 400 feet wide and 36 feet deep connects with the main harbor basin. The deeper depths over 40 feet will more economically serve deep-draft ships carrying primarily petroleum products. Pier 7 channel will serve general cargo and cruise ships while the Berth 18 channel is primarily for general cargo vessels. The funds to initiate work were appropriated for fiscal year 1979, and construction was initiated. The first of two contracts was awarded July 18, 1979. All channel deepening was completed in April 1984.

58. A feasibility report recommending Federal assumption of maintenance for non-Federal navigation improvements at Port Everglades Harbor has been completed. The Chief of Engineers submitted the report to the Secretary of the Army on September 23, 1991. The project was authorized in the Water Resources Development Act of 1992 and provides for Federal assumption of the channel and turning notch, which are now authorized for the harbor. The WRDA 92 also directs the Corps to examine the constructed works and determine the federal interest in reimbursement. Funds have not been provided for this provision. The 1993 traffic was about 16,297,000 tons.

PROBLEMS, NEEDS AND OPPORTUNITIES

59. Shoreline recession continues to be a problem along Florida's coastline. The net long-term (over numbers of years) sediment transport rate along the east coast of Florida is generally from north to south, with some localized flow reversals associated with complex hydrodynamic interactions at tidal inlets and/or some localized net long-term cross-shore (onshore or offshore) transport associated with localized bathymetric irregularities and/or resulting wave focusing. In general, as a result of the reduced wave climate (shielding from the Bahama Banks), the sediment transport rate is reduced from the north to the south. Sea-level rise, coastal storms and other natural and man-induced activities that influence the natural sediment transport processes will tend to maintain shoreline recession.

60. Tidal inlets have a tendency to interrupt the normal littoral transport of sediments along the coastline. If left to nature, over the long-term, inlets would naturally bypass sediments along the coast. Conflicts occur as a result of the multi-purpose uses desired in the coastal zone. The need to maintain inlet channels for commercial and recreational navigation, improve water quality, fisheries/nursery interchange characteristics within the interior water bodies, and maintain recreational uses of the adjacent beaches, often result in conflicting and competing interests.

61. The COFS provides the first opportunity to examine and evaluate coastal engineering problems on a regional basis in Florida since the 1974 National Shoreline Study. Environmental awareness, issues and constraints have also greatly increased since the development and authorization of these earlier projects. New laws, regulations and requirements for project development and new technological approaches to coastal shoreline erosion protection have been developed and instituted since some of the earlier shore damage reduction projects were approved. Previous beach erosion control protection and storm damage reduction projects were developed on a project by project basis that may have been limited by imposed jurisdictional boundaries or other constraints.

62. Improved management of the coastal zone is critical with increasing pressures associated with the continued growing population demands and shrinking natural and economic resources. The regional approach to project formulation and the systems approach to examining coastal processes and natural resources should provide the means for developing enhanced, cost effective and efficient shore protection storm damage reduction projects and related navigation projects.

Federal Prospective

63. The Federal Government is interested in reducing the cost of construction, nourishment, operation and maintenance of shore protection and navigation projects along the coastline of Region III. As previously discussed, $90 million for initial restoration and $54 million for periodic nourishment, totaling $144 million ($71 million Federal and $74 million non-Federal) has been spent on Region III for 33.4 miles of federal shore protection projects between 1958 and October 1993. The cost to complete the unconstructed portions of the authorized projects, and continue nourishment in Region III totals $490 million.

64. An examination of the regional coastal processes affecting the shoreline of Region III using state-of-the-art numerical modeling techniques to assess project impacts is needed. Coupling these engineering studies with a regional system-wide analysis approach provided by GIS technology would provide the means to analyze and determine more efficient and cost effective project modifications.

65. An additional underlying study objective from the federal prospective is to better coordinate shore protection projects with navigation projects in an attempt to mitigate negative impacts at inlets. Until this present study, beach projects and navigation projects have basically been separately formulated, authorized and constructed. Increasing the sand bypassing at each of the inlets within Region III is a primary goal of this study. Where applicable, improved sand transfer systems will be recommended for approval. Near-shore sites for beach quality maintenance dredged material disposal will also be developed for the eight maintained navigation inlets.

66. The development and use of near-shore berm technology has recently been satisfactorily applied at some test locations along the Atlantic and Gulf coasts. The use of this technique may prove to be feasible along the Region III shoreline in specific situations. For example, nearshore berms may provide a reasonable alternative for shore protection in areas where environmental and/or other constraints prohibit or limit on-beach renourishment. This application approach is assessed in this report on a case by case basis.

67. Development of the authorized comprehensive body of knowledge on the coastal processes and natural resources in Region III, as documented in the database design (USACE, Phase III) and accessible through the COFS GIS database central repository maintained by DEP, will provide long-term benefits to the management of the coastal zone in Florida. The improved understanding of project impacts or effects on the shorelines and on the environment will help reduce or mitigate negative impacts as needed. The database will also help reduce project time from authorization to construction with the ability to provide detailed data and maps needed for design and contract plans and specifications, such as real estate lands, access points, locations of borrow areas, existing structures and environmental resources.

State Perspective

68. The State of Florida is critically dependent on a carefully balanced approach to coastal zone management for maintaining its economic soundness and well-being. The beaches of Florida are one the most valuable resources of the State and a primary source of State revenue. Navigation, including recreational and commercial shipping and cruise shipping are also extremely important industries within the State. As a result, the State has adopted a very aggressive and proactive approach to shoreline management. To support this increased interest, the State has spent over $146 million between its erosion control trust fund and its beach management trust fund through its 94-95 fiscal year. About 83 percent of this amount has been spent during the last 15 years (1980 - 1981 to 1994 - 1995). As shown in Table 8, $107 million in state funds have been spent specifically for beach nourishment, $18 million for sand transfer, and $9.4 million for dune restoration.

69. The State has adopted three primary avenues for addressing management issues along the coastline. These are: 1) the regulation of development along the shoreline, 2) restoration of eroded beaches, and 3) purchase of undeveloped coastal lands.

FEDERAL OBJECTIVES

The Planning Process

70. The process that has evolved on a Federal level to assist in formulating and evaluating water resource projects is the National Economic Development objective, or NED. The underlying fundamental economic problem is that we cannot do everything. The NED principle is a policy developed to guide Federal water resource planners in their choice of problem solutions. Choice is the fundamental business of

TABLE 1
STATE OF FLORIDA EROSION CONTROL TRUST FUND AND
BEACH MANAGEMENT TRUST FUND PROJECT EXPENDITURES
(ACTUAL DOLLARS)

State Fiscal Year	Beach Nourishment	Sand Transfer	Dune Protection	Structural Solutions	Beach Management	Inlet Management	Research and Other	Annual Total
58 – 65	90,766	0	0	65,000	0	13,650	143,000	312,416
65 – 66	0	25,000	0	130,811	0	0	0	155,811
66 – 67	146,720	0	0	24,660	0	12,100	93,596	277,076
67 – 68	24,000	46,366	0	0	0	0	15,388	85,754
68 – 69	0	159,650	0	9,000	0	0	114,514	283,164
69 – 70	88,089	0	0	0	0	0	1,875	89,964
70 – 71	667,761	121,500	0	0	0	14,810	1,247	805,318
71 – 72	125,058	119,309	0	52,705	0	0	21,926	318,998
72 – 73	325,578	27,046	0	0	0	0	0	352,624
73 – 74	1,670,063	0	0	140,000	0	1,911	27,950	1,839,924
74 – 75	1,453,536	254,877	5,000	0	0	92,270	47,223	1,852,906
75 – 76	1,612,297	0	0	57,124	0	0	59,552	1,728,973
76 – 77	2,367,245	82,640	40,860	0	0	0	21,158	2,512,103
77 – 78	4,478,630	45,000	47,348	0	0	0	32,265	4,603,243
78 – 79	493,851	0	17,829	0	0	0	37,944	531,624
79 – 80	7,129,293	1,658,169	195,523	0	8,620	0	39,438	9,030,843
80 – 81	3,943,839	0	203,001	0	117,448	0	5,100	4,269,388
81 – 82	6,991,800	944,250	161,958	0	0	0	82,551	8,180,557
82 – 83	1,200,000	1,418,177	294,638	72,000	149,793	0	0	3,134,608
83 – 84	5,394,259	2,030,010	2,699,415	225,675	0	0	305,572	8,654,931
84 – 85	1,331,000	735,777	286,022	316,750	0	0	0	2,595,549
85 – 86	250,000	80,000	1,009,975	267,971	61,274	85,679	18,000	1,772,899
86 – 87	7,981,032	1,000,000	58,616	32,000	0	0	0	9,071,648
87 – 88	7,836,813	2,375,000	0	260,000	0	0	125,000	10,596,813
88 – 89	12,595,000	2,263,000	491,117	1,000,000	0	0	75,419	16,424,536
89 – 90	10,191,223	1,564,687	1,104,846	1,762,500	0	0	500,000	15,123,266
90 – 91	13,957,941	2,281,375	3,282,447	200,500	0	0	0	19,722,263
91 – 92	4,903,147	103875	0	0	0	1,896,125	0	6,903,147
92 – 93	0	400,000	0	0	0	0	0	400,000
93 – 94	8,839,500	948,000	0	0	0	1,058,000	721,500	11,567,000
94 – 95	2,500,000	0	0	0	0	0	0	2,500,000
95 – 96								
TOTALS	106,590,423	18,683,906	9,760,393	4,898,696	337,155	3,174,545	2,490,218	143,715,338

economics. Because all resources are scarce, we are forced to make choices when they are used. Choose more of one thing and you simultaneously are choosing less of another. The process of developing a plan for the use of a water resource is an exercise in dealing with the fundamental economic problem of scarcity. The NED principle ensures that a project will be constructed only if the project outputs - the benefits to the Nation from the use of the resource - exceeds the cost of using it.

71. The Federal planning process consists of the following major steps:

a. Specification of the water and related land resources problems and opportunities associated with the Federal objective and specific state, county and municipal concerns.

b. Inventory, forecast and analysis of water and related land resource conditions within the planning area relevant to the identified problems and opportunities. The identification of problems, opportunities and needs was discussed earlier in the report.

c. Formulation of alternative plans.

d. Evaluation of the effects of the alternative plans.

e. Comparison of alternative plans.

f. Selection of a recommended plan based on the comparison of alternative plans.

Planning Objectives and Constraints

72. Principles and Guidelines. The "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" (The Principles and Guidelines, or P&G) are the principle guidelines for planning by Federal agencies involved in water resource development (USWRC, 1983). Although each project and project setting presents unique problems and opportunities, the U.S. Army Corps of Engineers applies a consistent set of decision criteria to participation in project planning and construction. There are three basic criteria:

(1) that there be an economically justified and environmentally acceptable project. Widespread use of benefit-cost analysis as a test of a project's economic worth is generally considered to have grown out of the Flood Control Act of 1936. In this Act, Congress required that

the U.S. Army Corps of Engineers recommend a project only "if the benefits to whomsoever they may accrue are in excess of the estimated costs and if the lives and social security of people are otherwise adversely affected."

If there is an economically justified project, decisions on whether and to what extent there should be Federal participation are guided by a concept of the Federal interest that has evolved from legislation, from precedent in project authorization and construction, and from Administration budget priorities.

(2) Federal participation must be otherwise warranted. Federal participation is limited in circumstances where there are special and local benefits which accrue to a limited number of identifiable beneficiaries. The Federal government does not participate in facilities which produce outputs incidental to basic project purposes.

(3) The project must meet current Administration budget priorities. The Administration does not budget for a project unless a significant proportion of the project outputs have a high budget priority.

73. The Federal objective, as stated in the P&G, is to contribute to national economic development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. In other words, economic benefits to the Nation must exceed project costs, without unnecessary sacrifice of environmental resources.

Federal planning concerns other than economic include environmental protection and enhancement, human safety, social well being, and cultural and historic resources. Environmental and safety considerations are of prime importance. In developing project modifications or proposed new projects, the Corps:

a. Provides for full consideration of measures to protect, enhance and restore ecological, esthetic, historical and cultural resources;

b. Attempts to obtain the best available information on the environmental effects of plans through an exchange of views and information with resources agencies at all levels of government, affected interests and the public;

c. Provides equal consideration throughout planning for environmental, economic, social, financial and engineering factors in plan scoping, development, evaluation and modification of the authorized projects or new proposed projects;

d. Attempts to minimize adverse environmental effects, including irreversible commitments of resources, and to mitigate unavoidable losses to the extent appropriate, concurrent with project construction.

74. Federal Environmental Objectives. The Corps complies with all environmental laws and executive orders. The Corps considers carefully and seeks to balance the environmental and development needs of the Nation in full compliance with NEPA and other authorities provided by Congress and the Executive Branch. Alternative means of meeting competing demands generated by human water resources needs are examined and their environmental values examined fully, along with the economic, engineering and social factors.

75. Public participation is encouraged early in the planning process to define environmental problems and elicit public expression of needs and expectations. Municipal, county, state and other Federal agencies are contacted early for their views and provided timely information before making recommendations. Significant environmental resources and values that would likely be impacted, favorable as well as adversely, by alternative being considered are identified early in the planning process. All plans are formulated to avoid to the fullest extent practicable any adverse impact on significant resources.

76. Those significant adverse impacts that cannot be avoided are mitigated as required by Section 906(d) of the Water Resources Development Act of 1986. Section 906(d) requires the Secretary of the Army to include in reports submitted to Congress for authorization of construction a specific plan to mitigate fish and wildlife losses or a determination that the project will have a negligible effect on fish and wildlife. The NEPA document in this report describes the environmental impacts of the authorized projects and proposed project modifications and summarize compliance with the Federal statutes and regulations.

77. Historic Shoreline. Participation in shore protection projects is limited to beach restoration and protection, not beach creation or improvement unless such improvement is needed for engineering purposes. The term "restoration" was substituted for "improvement" in the amendment of July 28, 1956 (P.L. 826, 84th Congress, 70 Stat. 702) so that the basis for Federal concern became "restoration and protection" as opposed to creation of new lands (House Report No. 2544 and Senate Report No. 2691, 84th Congress). Accordingly, Federal participation in restoration is limited to the historic shoreline. It does not provide for Federal cost sharing in extending a beach beyond its historic shoreline unless required for protection of upland areas.

78. In addition, the Federal cost share is reduced proportionately to the extent that a project protects private shores from beach erosion and land loss. Section 103(d) of the 1986 Water Resources Development Act specifically prohibits Federal participation in project costs assigned to benefits to privately owned shores, where use of such shores is limited to private interests, or to prevention of losses of private lands.

79. Federal Project Purposes. Shore protection projects have been authorized for a variety of purposes: beach erosion control, shore/shoreline protection, flood control, hurricane/hurricane wave protection and storm protection. The WRDA of 1986 now assigns costs of Federal projects to appropriate project purposes. Projects which provide hurricane and storm damage reduction are assigned a 65 percent Federal share. Projects which provide for separable recreation were assigned a 50 percent Federal share. The costs for construction projects or measures for beach erosion control and water quality enhancement are assigned to either hurricane and storm damage reduction, or recreation. The Federal Government does not participate in any work relating to recreation facilities at shore protection projects.

80. Recreation is not considered to be high priority output or primary project output under current Department of Army policy. This policy precludes federal funds to support construction of shore or hurricane protection projects which depend on separable recreation benefits for economic justification, or for which incidental recreation benefits are greater than 50 percent of the total benefits unless the project is economically justified based on primary outputs alone, or based on the combination of primary benefits and an equivalent amount of incidental recreation benefits.

81. Geographic Applicability. Storm damage reduction, beach erosion control and hurricane and abnormal tidal flooding authorities are applicable to the shores of the U.S., including the estuaries and bays directly connected therewith. Authority for shore protection project activities extend only the distance up tributary streams where it can be demonstrated that the dominant causes of erosion and damage are ocean tidal action (or Gulf of Mexico or Great Lakes water motion) and wind-generated waves. Erosion at upstream locations caused by stream flows or vessels are not included. Lake flood protection activities are generally limited to the Great Lakes.

82. Additional Federal Guidelines. The general Federal objectives dealing primarily with broad planning guidelines are described above. Other general study objectives assure that any new project recommended for construction, or proposed modifications to existing hurricane and storm damage reduction projects are formulated to:

a. Meet the specific needs and concerns of the general public within the project area.

b. Be part of or developed in conjunction with a "systems approach." Alternative plans that consider a broad range of possible impacts including impacts that occur on larger scale, were developed. The combined effectiveness and economic efficiency of the shore protection, navigation maintenance and dredged material disposal programs can then be optimized.

c. Respond to expressed public desires and preferences.

d. Be flexible to accommodate changing economic, social, and environmental patterns and changing technologies.

e. Integrate with and be complementary to other related programs in the study area.

f. Be implementable with respect to financial and institutional capabilities and public consensus.

83. A plan that reasonably maximizes net national economic development benefits, consistent with the Federal objective, is the goal of the Federal plan formulation and analysis process. This plan will be identified as the NED plan. The NED plan must also meet the test of four additional criteria:

a. Completeness. The extent to which a given modification of the authorized project provides and accounts for all necessary investments or other actions to ensure the realization of storm damage reduction.

b. Effectiveness. The extent to which a given modification of the authorized project contributes to a solution to the shoreline erosion and storm damage problems and achieves protection from storm damages.

c. Efficiency. The extent to which a given modification of the authorized project is the most cost effective means of providing storm damage protection, consistent with protecting the Nation's environment.

d. Acceptability. The viability of a given modification to the authorized project and it's acceptance by the non-federal project sponsor, state entities and the public, and compatibility with existing laws, regulations, and public policies.

84. Four accounts are established to simplify evaluation and display of effects of alternative plans. These four accounts encompass all significant effects of a plan on the human environment as required by the National Environmental Policy Act of 1969 (NEPA). They also encompass social well-being as required by Section 122 of the 1970 Flood Control Act. The national economic development account is included, since it is the primary Federal objective. Other information that is required by law or that will have a material bearing on the decision-making process is included in the other accounts listed below:

a. National Economic Development (NED). This account displays changes in the economic value of the national output of foods and services.

b. Environmental Quality (EQ). This account displays non-monetary effects on significant natural and cultural resources.

c. Regional Economic Development (RED). This account registers changes in the distribution of regional economic activity that result from project construction. Evaluations of regional effects are to be carried out using nationally consistent projections of income, employment, output, and population.

d. Other Social Effects (OSE). This account registers project effects from perspectives that are relevant to the planning process, but are not reflected in the other three accounts.

85. Interagency Coordination. Interagency collaboration through all stages of project development and implementation is paramount to the success of the Civil Works Program. In the interest of interagency coordination on planning studies and trying to avoid issues arising very late in the planning process, the following have been applied to the Coast of Florida Region III study:

86. Interagency Coordination. Interagency collaboration through all stages of project development and implementation is paramount to the success of the Federal Civil Works Program. The purpose of interagency coordination on planning studies is to avoid issues arising very late in the planning or preconstruction engineering and design process which would delay project implementation. A brief summary of the interagency coordination for this study follows:

a. Meetings:

January 28 1985 Workshop. A coordination meeting was held including an initial technical workshop session on coastal processes with Corps representatives from Jacksonville District, Mobile District, South Atlantic Division, Washington, and the Coastal Engineering Research Center. Representatives from the Florida Department of Natural Resources, the University of Florida, the University of Miami, the University of California at Berkley, Florida Sea Grant, Florida Shore and Beach Preservation Association, the Florida Office of Coastal Zone Management, and the National Ocean Service attended. Corps representatives from South Pacific Division, Los Angeles District and San Francisco District provided information relating to the Coast of California study. The meeting included evaluation of the study's Congressional authority, goals and objectives by the study participants.

February 26, 1985 Meeting. This meeting was held with representatives from the Corps' Jacksonville District, Mobile District, and the Coastal Engineering Research Center. Representatives from the Department of Natural Resources, the U.S. Fish and Wildlife Service, and the Office of the Governor attended. The meeting was the initial coordination effort to establish an environment data base and to discuss the scope of the necessary environmental studies. This was followed by a meeting on March 18, 1985 with representatives from the Corps' Jacksonville and Mobile Districts, the Department of Natural Resources, the U.S. Fish and Wildlife Service, and the National Coastal Ecosystems Team from the U.S. Fish and Wildlife Service office in Slidell, Louisiana. This meeting focused on possible utilization of the Slidell computer and graphic capabilities.

April 1, 1985 Meeting. A coordination meeting was held to involve county interests from Region III in the study. Corps representatives from Jacksonville District, Mobile District, South Atlantic Division, and the Coastal Engineering Research Center attended. Representatives from the Florida Department of Natural Resources, the University of Florida, the University of Miami, and representatives from Dade, Broward and Palm Beach Counties attended. The study schedule network and scopes of work were discussed. Data collection and analysis needs for development of regional coastal processes numerical models were discussed.

June 27, 1991. A meeting was held in Ft. Lauderdale to meet with representatives of Dade, Broward and Palm Beach Counties to discuss the need and scope of environmental work, particularly side scan sonar. The Florida Department of Natural Resources also attended.

May 6, 1992. A meeting was held to review the progress of the study in Atlanta, Georgia. Corps representatives from Jacksonville District, South Atlantic Division, Washington and the Coastal Engineering Research Center attended, along with the members of the Florida Department of Natural Resources. The civilian members of the Coastal Engineering Research Board, Dr. Robert Reid, Dr. Robert Dalrymple, and Dr. Fredric Raichlen, were briefed on scopes, schedules and technical aspects of the study, particularly regional numerical modeling and the use of GIS for coastal applications.

October 22-26, 1992. A beach-inlet workshop was held. Approximately 45 persons attended, including representatives from SAJ, SAD, CERC, DNR, five universities, and five consulting firms. The beach/inlet interactions with respect to coastal processes and coastal engineering technology for effective management, and relevance of current issues to the inlets in Region III was the focus of the meeting. The meeting focus was to develop a pro-active framework for future work using a regional and integrated management approach.

December 14, 1993. A Technical Review Conference (TRC) was held. Representatives from the Corps' Jacksonville District, South Atlantic Division, Washington office, and the Coastal Engineering Research Center attended. Representatives from the Florida Department of Environmental Protection, Dade County, Broward County and Palm Beach County attended. The U.S. Fish and Wildlife Service was invited, but did not attend. The preliminary alternative plans were discussed, along with other items such as cross-shore and longshore numerical modeling and GIS developments. The status of environmental, economic, geotechnical and other related studies was presented.

Coordination meetings with the Coastal Engineering Research Center were held on: November 14, 1990; January 15-16, 1991; August 13, 1991; and November 8, 1994.

Coordination meetings were held with the Florida DEP in Tallahassee on the following dates: February 11, 1991; March 8, 1991; November 20, 1991; December 3, 1991; March 27, 1992; September 22, 1993; and April 7, 1994.

Coordination meetings were held with the Florida DEP in Jacksonville on the following dates: October 20, 1991; April 22, 1992; and August 20-21, 1992.

b. Published Documents:

Numerous reports have been published relating to study topics. A Preliminary Draft Region III Feasibility Report dated October 1994 has been prepared. The report was coordinated with SAD, HQ, CERC, DEP and Dade, Broward and Palm Beach Counties. In particular, the preliminary recommendations for project modifications were included in the report, and later discussed at the meeting held in December 1994.

Newsletters for the study were prepared as part of the public coordination effort. The coordination mailing list contains over 500 addresses. The following newsletters have been issued: Volume 1, Number 1, Coast of Florida Erosion and Storm Effects Study UPDATE, January 1992, Study overview. Volume 1, Number 2, Coast of Florida Erosion and Storm Effects Study UPDATE, August 1993, GIS overview.

c. Conferences -

The study progress is presented at the annual meeting of the Florida Shore and Beach Preservation Association (FSBPA). Study progress has been reported at this conference annually since 1986.

Coastal Zone 91/Waves 91 - July 1991 Presentations of Region III wave data were made.

The FSBPA Technical Conference in January 1993 and the ASCE Hurricane Conference in December 1993. A presentation on the Impacts of Andrew on Region III was made.

d. Federal agencies were invited to be cooperating agencies as defined by NEPA. Environmental scoping letters were sent to EPA and F&WS. This and other resource agency coordination is summarized in the draft accompanying this report.

STATE OBJECTIVES

Introduction

87. Florida's ocean coastline is among the most diverse shorelines in the United States, containing barrier islands, mangrove swamps; coral keys; and long, sandy, mainland beaches. Barrier islands, spits, and capes line much of

Florida's east coast, the panhandle, and the southern two-thirds of the west coast. The Florida Keys, which are geologically different from the rest of the Florida coast, consist of uplifted coral reefs and carbonate sand banks.

88. Florida is now the third most populous state in the U.S. From 1970 to 1980 the population increased by approximately 3 million people, and the state's population is predicted to total nearly 17 million by 2010 (Godschalk et al., 1989). A very high proportion of Florida's population lives in coastal counties. Furthermore, the majority of the state's 32 million tourists visit and stay near the coast (Florida Atlantic University, 1986). The resulting development pressure is greatest on Florida's barriers and mainland sandy beaches.

89. Approximately 538 miles of Florida's 802 miles of sandy beach shoreline are privately owned. About one-fifth of such private, sandy shorelines remains largely undeveloped. During the 1980's, approximately 15 miles of shoreline, just under 2 percent of Florida's sandy beaches, were newly developed. In the same period, public ownership of coastline increased by approximately 9 percent with the acquisition of 22 miles (Florida Division of Beaches and Shores, 1990).

90. Florida is potentially more vulnerable to hurricanes and coastal storms than any other U.S. state. Of the hurricanes that made landfall on the U.S. mainland in the last century, nearly 60 percent hit the Florida coast (Godschalk et al., 1989). Furthermore, all of the state's 8,400 miles of tidal shoreline are low-lying and vulnerable to serious hurricane flooding (Kusler, 1983). Hurricane occurrences in Florida have been very cyclical. During the period 1911 to 1920, only one tropical storm occurred within a 50-mile radius of Dade County. This compares to 1941 to 1950, when 14 hurricanes and three tropical storms once within a 50 mile radius of Region III. The most recent hurricane to strike Region III, Hurricane Andrew, devastated southern Dade County in August 1992.

91. Over one-third of the Florida's beaches are eroding. Of the 820 miles of shoreline surveyed, the Florida Division of Beaches and Shores has identified 338 miles of Florida's shoreline as "problem erosion areas." Of these 338 miles, 95 miles along the Gulf and 124 miles on the Atlantic are designated at "critical erosion areas" - stretches of shoreline where erosion threatens substantial development and recreational interests (Clark, 1990).

92. Historically, Floridians used erosion control structures to stabilize their shifting shorelines.

Florida's first seawall was built in 1690 in Saint Augustine. Today bulkheads, seawalls, and revetments are common along the Florida shore, and jetties lie along many of the inlets between barrier islands. Since the 1960's, Florida has increasingly turned to beach restoration and renourishment to preserve the state's eroding beaches. By October 1993, about 73 miles of Florida's shoreline were renourished as part of authorized Federal projects. About half of Florida's beach replenishment projects (34.3 miles) have been undertaken in the state's heavily developed southeastern counties in Region III. In 1982, the largest project in Florida was completed, the Dade County Hurricane and Storm damage project. The project required moving 13.2 million cubic feet of sand from offshore sources, cost $54.5 million for initial construction, and $10.7 million for subsequent periodic nourishment. Through 1994, another 425,000 cubic yards of sand was back placed on the project's beaches.

Coastal Management Program

93. Florida's Coastal Management Program was established under the Coastal Management Act of 1978 (Florida Laws, Chapter 380) and approved by the Federal Coastal Zone Management office in 1981. Florida does not regulate its coastal zone through one comprehensive law, but rather through 25 state statutes. Although the Department of Environmental Regulation is the lead coastal program agency, 16 other state agencies are involved in administering the program (Balsillie, 1988). In particular, the Department of Natural Resources (DNR), which regulates coastal development, and the Department of Community Affairs play key roles in the coastal management program.

The Beach and Shore Preservation Act

94. The Beach and Shore Preservation Act (Chapter 161, Florida Statues) is Florida's primary statute for regulating coastal development. The act, which is administered today by the Department of Environmental Protection (DEP), Bureau of Beaches and Coastal Systems (BB&CS), was first passed in 1965 and has since been significantly amended (Florida Atlantic University, 1986). In the act, the legislature asserted that Florida's beaches and coastal barrier dunes are among the state's most valuable natural resources and that these resources should be protected from "imprudent construction which can jeopardize the stability of the beach-dune system, accelerate erosion, provide inadequate protection to upland structures, endanger adjacent properties or interfere with public beach access" (161/053).

Coastal Construction Control Lines

95. To ensure that such "imprudent construction" does not take place, the statute charges the DEP to define and establish Coastal Construction Control Lines (CCCL). These lines define the landward limit of the active beach-dune system and vary from a few to several hundred feet inland of mean high water. The specific location of the line is a function of the predicted storm surge and erosion resulting from a 100-year storm. The DNR has established control lines on a county-by-county basis for Florida's 24 sandy beach counties (161/053). Nine of Florida's 33 coastal counties are not considered to be predominantly sandy beach counties and do not, therefore, have CCCL's. The unregulated counties stretch from Wakulla to Pasco County, located on the Big Bend, and Monroe County in southern Florida (Balsillie, 1988).

96. Florida is one of the first States to develop a coastal construction control line program. This program was initiated through legislative action in 1970. The primary goal of this program was the control of coastal construction to curtail impactive and imprudent development. Included in this effort was the establishment of a coastal monumentation program for survey and documentation purposes. Control monuments have been established approximately every 1,000 ft along the coastal shoreline of all beach front areas, generally located on the shoreward side of existing dune lines away from normal shoreline erosion forces. These monuments serve as the starting reference for beach survey purposes. Massive primary monuments are located further landward and serve as primary monuments for all controlled survey work. All monuments are tied to the State Plane coordinate system.

97. Using numerical modeling storm programs and engineering expertise, including historical shoreline studies and recent survey data, the State has established coastal construction control lines that reflect the determined 100-year storm impact location along each stretch of beach front property. Acceptance of this line goes through an elaborate review process and is finally established as a regulatory line for construction purposes.

98. The CCCL is a line of regulation-not of prohibition (Robert Dean, University of Florida, personal communication, June 1989). Prior to building or excavating seaward of the control line, a permit must be obtained from the DEP. The primary purposes of this permitting program are to 1) ensure that construction seaward of the control line is designed and sited to protect beaches and dunes from damage, 2) ensure that construction seaward of the line does not result in accelerated erosion on adjacent land, and 3) increase the chance that structures seaward of the line will survive severe storms (Florida Atlantic University, 1984).

99. Before granting a coastal construction permit, the DEP must consider: 1) shoreline stability and the impact of storm tides; 2) design features of the proposed structures or activities; and 3) potential impacts of the building or activities, including cumulative effects, on the beach-dune system. The department may grant a building permit in areas where a "reasonably continuous" line of existing construction located seaward of the control line is not "unduly threatened by erosion" (161/053).

100. The Beach and Shore Preservation Act also regulates construction of shore protection devices below mean high water (161/041). Prior to building such a structure, a coastal construction permit must be issued by the DEP. Certain types of structures and activities are exempt from the permit program: 1) construction on vegetative non-sandy shores; and 2) modification, maintenance, or repair of existing structures within the limits of existing foundations (Florida Atlantic University, 1986).

101. Florida's Administrative Code (16B-33) sets specific standards and regulations for construction seaward of the control line: 1) all habitable structures must be pile-supported, elevated above the projected 100-year storm surge, and designed to withstand 140 mph winds; 2) existing beach topography must be protected; 3) the maximum effort must be made to protect all native, stabilizing vegetation; 4) seawalls and all nonessential coastal protection structures are generally not permitted; 5) in severely eroding areas, structures must be located as far landward as possible; and, 6) all construction must be designed to minimize erosive effects.

102. Before setting control lines, the DEP must hold a public hearing in the affected county. The results of the hearing must be considered prior to determining the location of the control line (161/053). Once the department has established CCCL's, their location must be recorded in public records (161/053).

103. To determine the appropriate location of a control line, the state considers long-and short-term erosion rates, existing upland development, and expected impacts of a 100-year storm. The state contracts with the Florida State University Beaches and Shores Resource Center to assess the impacts of predicted hurricane storm tides. The center uses the storm tide model developed by Dr. Robert Dean to predict water levels, wave heights, and dune and bluff erosion accompanying a 100-year storm event (Balsillie, 1988).

104. For each control line study, stereoscopic aerial photographs are taken. These are then reproduced to provide detailed maps with a 1:100 scale (Balsillie, 1988). These maps are compared to historical maps, beach profile surveys, and photographs to determine long-term erosion rates. For a typical county, five to six surveys, dating from the mid-1800s to the present, are used to compute erosion rates (National Research Council, 1990).

105. To measure shoreline change over relatively short time periods, the state has established over 3,400 concrete monuments at 1,000-foot intervals along the coastline (National Research Council, 1990). These monuments are in turn referenced to a system of larger monuments that are located farther inland. As part of the state's ongoing CCCL delineation and monitoring program, beach profiles are periodically measured from the control line monuments. In addition, the state also conducts post-storm surveys that provide Florida with a comprehensive pre-and post-storm data base (Balsillie, 1988).

Erosion Setbacks

106. The 1985 State Comprehensive Growth Management Act (Chapter 85-55) amended the Beach and Shore Preservation Act to include a construction setback provision for all sandy beach counties. The amendment prohibits the DEP from granting most coastal construction permits on land that will be seaward of the seasonal high water line within 30 years (161/053). The 30-year erosion projection cannot, however, extend landward of an established CCCL (161/053).

107. The DEP can grant coastal construction permits for shore protection structures, piers, and minor structures seaward of the 30-year setback line. The DEP will permit construction of a single-family residence seaward of the line only if: 1) the parcel was platted prior to adoption of the amendment, 2) the landowner does not own another parcel adjacent to and landward of the parcel proposed for development, and 3) the structure is located landward of the frontal dune and as far landward as practicable (161/053). In addition, repairs or reconstruction of a building cannot "expand the capacity of the original structure seaward of the 30-year erosion projection" (161/053). The department can, however, issue a permit for landward relocation of a damaged or existing structure if the relocation will not damage the beach-dune system (161/053).

108. The DEP uses long-term erosion rates to delineate the location of the 30-year erosion projection. DEP must also consider the presence of shore protection structures and beach renourishment projects in determining the appropriate location of the erosion projection (161/053).

Coastal Building Zone

109. The 1985 Growth Management Act further amended the Beach and Shore Preservation Act to establish a coastal building zone extending landward of coastal construction control lines. Within the coastal building zone, strict building codes ensure that all major structures are designed and constructed to withstand the forces of and erosion caused by a 100-year storm event (Florida Atlantic University, 1986).

110. For mainland beaches, barrier spits, and peninsulas lying within Florida's sandy beach counties, the coastal building zone extends from the seasonal high water line to 1,500 feet landward of the coastal construction control line. On barrier islands, the entire island or the area from the seasonal high water line to a maximum of 5,000 feet inland from the control line is included in the building zone (161/54). All land areas within the Florida Keys, regardless of island size, also lie within the coastal building zone (Florida Atlantic University, 1986). In counties that lack CCCLs, the coastal building zone is equivalent to the National Flood Insurance Program's V-zone. (FEMA defines the V zone, which is a coastal high hazard area, as a special flood hazard area that extends from offshore to the inland limit of a primary frontal dune or any area subject to high velocity wave action from storms or seismic sources).

111. Within the coastal building zone, major structures must conform to the state minimum building code, be designed to withstand all anticipated loads resulting from a 100-year storm, and be constructed and located in compliance with NFIP regulations (161/55). The statute defines major structures to include houses, mobile homes, commercial and public buildings, and all other construction that has the potential to substantially affect the coastal zone (161/54). Minor structures, such as dune walkways, tennis courts, and gazebos, need not meet these standards, but must be designed to "produce the minimum adverse impact on the beach and the dune system" (161/54 and 161/55).

Erosion Control Program

112. In 1986 the Florida legislature amended the Beach and Shore Preservation Act to address the statewide problem of beach erosion through a "state-initiated program of beach restoration and beach renourishment" (161/101). The legislature declared that "beach erosion is a serious menace to the economy and general welfare of the people of this state and has advanced to emergency proportions" (161/088). Correspondingly, the legislature concluded that state management was necessary to ensure that Florida's beaches were properly managed and protected (161/088). Although the state had funded and participated in coastal erosion control projects since 1965, most of these projects were locally initiated and were not part of a comprehensive state plan (Florida Atlantic University, 1986).

113. The statute directs the DEP to develop and maintain a comprehensive long-term management plan for restoration of Florida's critically eroding beaches (161/101). The plan must: 1) address long-term solutions to the problem of severely eroding beaches; 2) evaluate each improved navigational inlet to determine its contribution to the erosion of adjacent beaches and provide specific recommendations for mitigating these impacts; 3) provide design criteria for beach restoration and renourishment projects; 4) evaluate feeder beaches as an alternative to direct beach restoration; and 5) establish a priority list for beach restoration land renourishment projects (Florida Atlantic University, 1986).

114. State funds for erosion control projects are available from Florida's Erosion Control Trust Fund (161/091). The fund provides money for erosion control; hurricane protection; and beach preservation, restoration, and renourishment projects (161/091). The state can pay up to 75 percent of the actual cost of restoring a critically eroding beach, while the local government in which the project occurs must provide the balance of the funds (161/101). State support for locally sponsored projects has largely been for beach restoration and renourishment and, to a lesser extent, dune restoration, revegetation, and dune walkovers (Florida Atlantic University, 1986). See Table 8 annual for DEP expenditures.

115. For a project to be eligible to receive state monies, it must meet two criteria. First, the project must establish an "erosion control line," which is equivalent to the mean high water line prior to beach restoration. After the beach is renourished and correspondingly widened, the erosion control line marks the boundary between state and upland ownership and guarantees public use of the beach seaward of the line. Second, the project applicant must provide public access points with adequate parking facilities at one-half-mile intervals along the restored beach (Balsillie, 1988). The existing erosion control lines are shown on the selected plan plates following the main text.

116. In 1986, as part of the comprehensive long-term plan for the management and restoration of Florida's critically eroding beaches, the Division of Beaches and Shores began identifying and classifying the state's eroding beaches (Clark, 1990). The division grouped Florida's erosion problems into three categories: 1) areas with high erosion rates; 2) areas with moderate or low erosion rates, but with a narrow beach fronting a highly developed area; and 3) restored beaches with an active maintenance program (Clark, 1990). These areas were then further defined as either: 1) "critical erosion areas," where erosion threatens substantial development or recreational interests; or 2) "noncritical erosion areas," where erosion processes do not currently threaten development or recreational interests (Clark, 1990). These categories of erosion are shown on plates 1-15 for Region III, in the main text.

Local Comprehensive Planning

117. The Local Government Comprehensive Planning Act of 1975 (Chapter 163, Florida Statues) requires that all local governments prepare, adopt, and implement comprehensive plans that address community growth and development needs. In the 1985 Growth Management Act, the Florida legislature strengthened the Planning Act in coastal areas and required that local, regional, and state comprehensive plans be consistent with each other. Under the Planning Act, coastal localities must include a "coastal management element" in their local plans (Godschalk et al., 1989). This section of the plan must be based on an inventory of the beach-dune system and existing coastal land uses and an analysis of the effects of future land uses on coastal resources (Florida Atlantic University, 1986).

118. Within the plan's coastal element, local governments must address disaster mitigation and redevelopment, designation of coastal high-hazard areas, beach protection, and shoreline use. The local plans must fulfill, among others, the following primary objectives: 1) protection of coastal resources; 2) limitation of public expenditures that subsidize development in coastal high-hazard areas; 3) direction of population away from coastal high-hazard areas; 4) management of development and redevelopment in coastal high-hazard areas to minimize risks to life and property; and 5) protection and enhancement of beach-dune systems (Florida Atlantic University, 1986; Godschalk et al., 1989).

119. If a local plan does not meet the requirements of the Growth Management Act, state funds to that jurisdiction may be curtailed (Godschalk et al., 1989). Furthermore, the state cannot issue funds to increase the capacity of local infrastructures unless improvements are consistent with the coastal management element in the local plan. The state can also restrict a locality from receiving post-disaster federal assistance. The state may choose not to include local projects on all state applications to the Federal Emergency Management Agency unless the municipality has adopted hazard mitigation and prevention plans (Godschalk et al., 1989).

Coastal Barrier Regulations

120. In the 1981 Coastal Barrier Executive Order (E.O. 81-105), the governor of Florida recognized the value of coastal barriers and set forth three requirements for state agencies that plan for, manage, and regulate the coastal zone. The governor directed that: 1) acquisition of coastal barriers was a priority; 2) federal and state money was not to be used to subsidize growth or post-disaster redevelopment on hazardous barriers; and 3) agencies were to manage growth in a manner consistent with the evacuation capabilities of coastal barriers (Florida Atlantic University, 1986).

121. The executive order did not provide state agencies with any specific powers to carry out its directives, but rather set for the overall policy for state actions on coastal barriers. Subsequently, in the 1985 Growth Management Act, the legislature enacted specific amendments to discourage growth and unwise development on coastal barriers (380/27 and 163/178). In particular, the act directed that state funds could not be used to build bridges or causeways to barrier islands that were not already accessible (Florida Atlantic University, 1986).

Coastal Acquisition

122. Florida has one of the largest state acquisition programs in the country in terms of money spent and land purchased (Florida Atlantic University, 1986). Acquisition of coastal land is among the key components of the state's land protection program. Florida's Save Our Coasts program, authorized under the Land Acquisition Trust Fund (375/041), provides monies specifically for acquisition of coastal properties. Enacted in 1981, the Save Our Coasts program authorized a $200 million bond issue for purchase of sandy beaches, barrier islands, and beach access points. Through July 1986, the program had purchased 2,713 acres of coastal land, representing 13 miles of shoreline (Florida Atlantic University, 1986). The state's coastal acquisition efforts target areas where the local government is willing to make a financial contribution to purchase the land and to manage it after it is acquired. Parcels in areas with a need for additional recreational beaches and sites susceptible to repeated erosion are also the focus of the acquisition program (Glassman, 1983).

FORMULATION OF ALTERNATIVE PLANS

123. The alternative plans considered were developed through a three-step process. These three steps were:

a. Identification and preliminary assessment of possible solutions. Costs and benefits have not been computed.

b. Development and assessment of intermediate-level-of-detail alternatives. Unit price cost estimates and benefits have been computed. Includes general discussion of potential environmental impacts.

c. Development and assessment of detailed alternative plans. Cost code of account level cost estimates have been computed, including the costs of lands, easements, rights-of-way and mitigation. Detailed benefits have been computed. Federal and non-Federal cost allocation is discussed.

124. Each step was iterative in the process of identifying and selecting the best course of action. Each alternative was considered in light of other projects within each reach or problem area. During the first step, the population of alternatives developed included traditional type projects, programs that could be carried out by non-federal interests, and all suggestions surfaced by participants in the meetings and workshops held. Each plan in the array was screened based on its ability to satisfy the planning objectives. The viable plans were carried forward into the intermediate level of detail and analysis, and were developed sufficiently to assess generalized benefits, costs and impacts. Those plans meriting closer evaluation were carried into the third step, development and analysis of alternative plans on a detailed level.

Systems Approach

125. The Coast of Florida study authority mandates a study of the entire coast of Florida to include a determination of whether any modifications of existing Federal shore protection and navigation projects are advisable. In response to this authority, a regional approach was adopted. The key theme of this approach is that erosion and storm damage problems do not stop at political or municipal boundaries, but rather have natural or physical limits. The physical boundaries of Region III are from Jupiter Inlet in Palm Beach County to the southern end of Key Biscayne in Dade County. These limits were selected since this portion of the east coast of Florida is sheltered from wave energy to a least some degree by the Bahama Islands. Within Region III, the study area was divided into adjacent reaches bounded by natural or manmade inlets, which serve to substantially interrupt or limit the continuity of natural longshore littoral processes. Each reach, or littoral cell, has similar natural process such as wave energy, geotechnical properties, littoral transport and associated beach and inlet processes.

126. Using a systems approach, a review of existing project impacts within each reach can be analyzed. Modifications to each project can be developed and other alternative plans considered within a systems context. The ultimate goal is to optimize the combined effectiveness and economic efficiency of the shore protection, navigation maintenance and dredged material disposal within each reach and adjoining reaches.

Physical Processes

127. The first step in a systems approach is to develop a sediment budget for the reach of coast under investigation. The sediment budget is based on modeling of sediment movement, empirical data, and estimates of net shoreline change rates over the past 50-year period, as well as the rate of change during the most recent decade. The effects and probability of occurrence of relevant storm events are determined. The magnitude of the average annual volumetric changes in beach area and volume for each reach are calculated. Plans are to be formulated using currently accepted design criteria for sea level rise (design is to be based on the historic rate of rise). A sensitivity analysis on what effect, if any, changes in the sea level rise rate would have on the plan evaluation and selection process is performed for those plans developed in detail.

Without Project Conditions

128. The man-made alterations to the shore, such as jetties, sand-bypassing and dredging, seawalls and other coastal armor, and artificial beach nourishment were inventoried. Their effect and contribution to the balance of littoral processes and shoreline changes was then determined. Based on this information and analysis, the without-project conditions were then established. These conditions by reach are summarized in Table 9. Determination of environmental resources and base conditions

TABLE 9

WITHOUT PROJECT CONDITIONS
COAST OF FLORIDA STUDY - REGION III

Location	DNR Monument Range			Erosion Control Line Established?	Pre-Project Shoreline
PALM BEACH COUNTY					
Jupiter/Juno	R - 13	to	R - 29	YES	1993
Lake Worth Inlet	R - 75	to	R - 78	NO	1990
N. Palm Beach Island	R - 76	to	R - 85	NO	1990
Palm Beach Island	R - 91	to	R - 105	NO	1990
S. Palm Beach Island	R - 116	to	R - 132	NO	1990
Ocean Ridge	R - 152	to	R - 159	YES	1994
Delray Beach	R - 175	to	R - 188	YES	1973
Highland Beach	R - 188	to	R - 205	NO	1990
Boca Raton	R - 205	to	R - 213	YES	1987
BROWARD COUNTY					
Deerfield Beach	R - 1	to	R - 25	NO	1990
Pompano	R - 26	to	R - 53	YES	1969
J. U. Lloyd	R - 86	to	R - 98	YES	1976
Hollywood/Hallandale	R - 101	to	R - 128	YES	1978
DADE COUNTY					
Golden Beach	R - 1	to	R - 7	NO	1990
Sunny Isles	R - 7	to	R - 20	YES	1987
Miami Beach	R - 27	to	R - 74	YES	1974
Key Biscayne	R - 91	to	R - 113	YES	1974

Assumptions:

1) No upgrades on existing structures throughout the life of the project.
2) Structures condemned due operational, but ineffective.
3) Existing sand transfer plants at Lake Worth and South Lake Worth Inlets are operational, but ineffective.

were an integral part of defining the without project condition. Plates 1 through 16 document the position of the without project shoreline. The without project condition includes the effects of implementing all reasonably expected nonstructural and conservation measures.

Anticipated Shoreline Changes

129. Determine beach erosion/shore protection nourishment and additional navigation-related dredging for the economic life of both existing and proposed measures, including dredging maintenance schedules and volumes at existing coastal inlets. This allows identification of the future "with" and "without" project conditions. Development of mitigation measures is developed for all alternatives, commensurate with the scope and phase of the planning effort, i.e, initial, intermediate and detailed plan formulation phases.

Economic Benefits and Costs

130. Inventory potential damages, development plans and estimate the costs of maintaining existing shore protection and navigation projects in the current or without project condition. The cost of mitigation measures is developed along with other costs of alternative plan features. Monetary value are to be expressed in average annual equivalents by appropriate discounting and annualizing techniques using the applicable discount rate. The same period of analysis is used for all alternative plans, which for the purposes of this study, is selected to be 50 years. The period of analysis does not include the implementation or construction period. All benefits and costs are expressed as of the beginning of the period of analysis.

a. Assess the extent of damageable property through analysis of storm surge and wave damage, assess the loss of recreation, and determine project impacts to jetties, channels and other navigation features.

b. Determine damage reduction benefits to the coastal system or reach for various increments of shore restoration or project alternatives. Only that portion of prospective average annual system losses which would be eliminated by the plan, or net gains to the littoral system, is a proper measure of average annual benefits.

c. Evaluate all beneficial and adverse impacts for each project alternative in accordance with Principles and Guidelines. The P&G criteria and other Federal and study plan formulation objects were identified earlier.

131. The above criteria were used to formulate possible modifications to the authorized projects for Dade, Broward and Palm Beach Counties according to the study guidelines and objectives. These criteria assure that all possible alternative projects are formulated in a systematic and reasonable manner.

Development of Enhanced Federal Projects

132. Enhancements of authorized Federal projects are analyzed in COFS. These include:

a. adjustments in berm widths for beach fill projects;

b. creation of nearshore berms with the use of dredged maintenance material which would decrease advance nourishment quantities;

c. sand-bypassing at inlets which would decrease renourishment intervals and quantities; and,

d. filling in gaps between projects, i.e. Golden Beach between Hollywood/Hallandale and Sunny Isles, which would decrease end losses.

Initial Development of Alternatives

133. The possible solutions considered in the first step of project formulation are listed in Table 10. Many of the alternatives were not retained for intermediate analysis because they did not fully address the planning objectives. Planning objectives discussed earlier were the basis for the selection of alternative plans for development of intermediate level of detail and analysis. The alternative of taking no action must be included throughout the planning process. Non-structural measures were also considered as means for addressing problems and opportunities.

134. Section 103(a) of the 1986 Water Resources Development Act (WRDA) specifies that non-federal interests will contribute 5 percent of the cost of project assigned to flood control. Section 103(c)(5) specifies that hurricane and storm damage reduction projects are to be cost shared at a 65 percent federal and a 35 percent non-federal basis. Section 103(c)(4) states that recreation projects are to be cost shared at 50 percent of separable costs. Section 103(d) states that the cost of constructing projects or measures for beach erosion control and water quality enhancement shall be assigned to the appropriate purposes listed above.

TABLE 10

POSSIBLE SOLUTIONS AND PLANNING ACCOMPLISHMENTS
COAST OF FLORIDA STUDY - REGION III

POSSIBLE MEASURES		Local Planning Objectives (1)				Principles and Guidelines Accounts (2)			
		RB	FP	EC	TBE	NED	EQ	OSE	RED
NONSTRUCTURAL MEASURES (NS)									
NS-1	NO ACTION	0 (3)	0	0	0	0	0	0	0
NS-2	Rezoning of beach area	0	P	0	P	P	0	P	P
NS-3	Modification of building code	0	P	0	0	P	0	P	0
NS-4	Construction setback line	0	P	P	P	P	0	P	P
NS-5	Moratorium on construction	0	P	0	0	0	0	0	0
NS-6	Flood insurance	0	0	0	P	0	0	P	0
NS-7	Evacuation planning	0	0	0	0	P	0	P	0
NS-8	Establish a no-growth program	0	0	0	0	0	P	0	0
NS-9	Condemnation of land & structures	P	P	P	0	0	F	P	0
NS-10	Various combinations of above	–	–	–	–	–	–	–	–
STRUCTURAL MEASURES (S)									
S-1	Beach revetment	0	P	P	0	0	0	P	0
S-2	Beach fill w/periodic nourishment	P	P	P	P	P	P	P	P
S-3	Beach fill w/periodic nourishment stabilized by offshore breakwaters	P	P	P	P	P	P	P	P
S-4	Beach nourishment w/maintenance material from adjacent inlets	P	P	P	P	P	P	P	P
S-5	Beach fill w/periodic nourishment stabilized by groins	P	P	P	P	P	P	P	P
S-6	Seawalls	0	P	P	0	P	0	P	0
S-7	Beach fill w/periodic nourishment & hurricane surge protection – sand dune	P	P	F	P	P	P	P	P
S-8	Beach fill w/periodic nourishment & hurricane surge protection project stabilized by offshore breakwaters or submerged artificial reefs	P	P	F	P	P	P	P	P
S-9	Nearshore berms	P	P	F	P	P	P	P	P
S-10	Beachfill with nearshore berms	P	P	F	P	P	P	P	P
S-11	Stabilization of beaches & dunes by vegetation	0	P	P	P	0	P	P	P
S-12	Feeder beach	P	P	P	P	P	P	P	P
S-13	Relocation of structures	0	F	P	0	0	P	0	0
S-14	Flood proofing of structures	0	F	0	0	0	0	P	0
S-15	Abandon or modify navigation projects	0	0	P	0	0	P	0	0
S-16	Sand tightening of jetties	0	0	P	0	0	P	0	0
S-17	Upgrading on construction of sand transfer plants for renourishment	P	P	P	P	P	P	P	P
S-18	Various combinations of above	–	–	–	–	–	–	–	–

NOTES:

1 RB – Provisions of recreation beach
FP – Protection of flooding and wave damage
EC – Beach erosion control
TBE – Protection of tourist base economy

2 NED – National Economic Development
EQ – Environmental Quality
OSE – Other Social Effects
RED – Regional Economic Development

3 F – Fully meets objective
P – Partially meets objective
0 – Not meeting objective

a. Before WRDA 86, federal projects to protect against hurricanes and abnormal tide flooding were established on a case-by-case basis, based on specific Congressional authorizations. Hurricane protection projects were viewed as being more like flood control projects from an authorization perspective prior to 1986. With the passage of WRDA 86, there are now no federal distinctions between shore protection measures for hurricanes, storms or tidal induced flooding and beach erosion.

b. Shore erosion must be caused by wind and tidal generated waves; therefore, the shore protection program does not cover erosion at upstream locations caused by stream flows except for those actions defined as emergency measures to protect highways, public works, and non-profit public facilities.

135. Implementation costs of mitigation of the adverse effects of a Federal navigation project on adjacent shores will be shared in the same proportion as the implementation costs for the navigation project which caused the shore damage. Although Federal implementation of a federal navigation mitigation project may include costs for lands, easements, rights-of-way, relocations and disposal areas, the Federal Government will not incur costs for access rights over or on properties the mitigation proposal is designed to protect. The sponsor of a Federal navigation mitigation project must agree to operate and maintain the structural and non-structural measures of the mitigation project. Department of Army Engineering Regulation 1105-2-100 dated December 28, 1990 contains general program guidance for the Corps' Civil Works programs.

136. Current shore protection law provides for federal participation in shore protection, provided that the restored beaches are open and available for public use. Federal cost sharing is based on Federal law, policy, and conditions of shore ownership and use at the time of construction or subsequent periodic nourishment.

Screening of Initial Alternatives

137. This section discusses the initial alternatives listed in Table 10 and selects those alternative retained for further evaluation.

a. NS-1 No action. The "no action" alternative allows the continuation of existing conditions and provides no solution to existing problems. However, it also avoids any undesirable effects that may be associated with structural or nonstructural plans of improvement. This option, although not favored by study sponsors in highly developed areas of the study area, is considered a viable alternative in underdeveloped areas.

b. NS-2 Rezoning of beach area. Rezoning of the beach area and modification of building codes would result from the implementation of a construction setback line. This is a viable measure for reducing storm damages and is carried forward as part of the nonstructural combination plan of the intermediate alternatives.

c. NS-3 Modification of building codes. "Hurricane proofing," where sufficient time exists before hurricane landfall, can reduce wind and rain damage but has no effect on tidal-flood reduction. Revised zoning regulations, more realistic bulkhead lines and minimum fill elevations would also result in less tidal flooding. In areas where modified building codes could help prevent damages, it should be considered. Therefore, this alternative is carried forward as part of the nonstructural combination plan.

d. NS-4 Construction setback line. A construction setback line would not affect existing development and could only be effective in the unforeseeable future as buildings are razed and destroyed by storms and replaced, and as buildings are constructed on the remaining undeveloped land. The State of Florida has established construction control lines along the shores of coastal counties and through a construction permit program, based on this line, is controlling indiscriminate development along Florida's coastline. This alternative is included in the nonstructural combination plan, and plans are developed around it.

e. NS-5 Moratorium on construction. Moratorium on construction would be rejected by local interests since the desired growth of the area is oriented towards tourism and recreation, attracting retirees and promoting a stable construction industry. However, the State of Florida is currently addressing the problem of growth management both at the Governor's level and within the Florida Legislature. Although there is no Federal involvement in this effort authorized under this study, the impact of laws, policies and guidelines on growth management in the study area will be included in the evaluation of all alternatives considered.

f. NS-6 Flood insurance. Flood insurance, per se, does not prevent damage; it merely lessens the monetary loss of the individual property owner. This alternative is impacted by the limitations imposed on Federal expenditures under the "Coastal Barriers Resources Act" (COBRA) which could limit unwise development of the coastal area and is carried forward as part of the non-structural combination plan.

g. NS-7 Evacuation planning. This is a nonstructural alternative which will be incorporated in the nonstructural combination plan.

h. NS-8 Establish a no-growth program. The establishment of a no-growth program is rejected by local interests but is one element of growth management plans being considered by the State Government. Growth in the area, particularly that in connection with beach activities, is needed to provide economic depth to the communities. This alternative is, therefore, included as part of the State's growth management efforts and will be considered in depth in the evaluation of all possible alternatives.

i. NS-9 Condemnation of land and structures. This alternative would allow the shoreline to erode in the area with a loss of land until shoreline equilibrium was established. This alternative does not provide any protection from erosion or wave damage but is implemented in some instances by the State in acquiring undeveloped shorefront properties. The alternative of buying undeveloped shorefront property to prevent future damages due to unwise development and to allow erosion to continue to nourish nearby beaches is an alternative that must be considered along with other non-structural alternatives.

j. NS-10 Various nonstructural combinations. It is recognized that various aspects of many of the preceding nonstructural solutions would be prudent to implement either collectively or in combination with structural alternatives. For the study shoreline, a single nonstructural plan is not applicable for the entire area.

k. S-1 Revetment. Revetments have been placed on beaches over the past to protect critically damaged or eroding areas. These measures have provided temporary relief, but have not reduced the erosion of the beaches. The hardening of the beach in one area can merely transfer the location of the problems further down the beach. However, to more fully determine the effects of hardfacing the shoreline, the revetment alternative will be carried at least through the intermediate alternative evaluation phase.

l. S-2 Beach fill with periodic nourishment. This alternative would provide a beach with project dimension size for recreational purposes as well as a buffer against wave attack. An offshore source of sand is considered as inland sources are unavailable due to environmental factors. Renourishment of the beach would be undertaken periodically to maintain the recreational and erosion control features within design dimensions. Within the study area, about 55 miles of shoreline has been successfully renourished (29,103,000 cubic yards of sand have been placed on the coast of Florida during construction of authorized beach erosion control projects since 1970). This is therefore a viable alternative.

m. S-3 Beach fill with periodic nourishment stabilized by an offshore breakwater or submerged artificial reef. The construction of breakwaters or reefs offshore along the problem areas is considered as an alternative to reduce periodic nourishment quantities needed to maintain a protective and recreational beach fill. Such structures would reduce the amount of wave energy reaching the shoreline in their lee. The formation of a partial tombolo would occur if the breakwaters are of sufficient size, thus, decreasing the rate of annual erosion and thereby decreasing the annual nourishment requirements. This is currently under implementation in Region II of the study area and is being demonstrated as a viable alternative.

n. S-4 Beach nourishment with maintenance material from updrift inlet. This alternative is similar to the previous beach fill alternative, but takes advantage of the material which is obtained from the maintenance dredging from adjacent inlets. Maintenance operations or new work has not occurred on a regularly scheduled basis, also all of the dredged material from the inlet might not be suitable and, in most cases, have not been sufficient to satisfy the nourishment requirements; therefore, this alternative is considered as a supplement to offshore borrow areas and will be included in evaluation of alternatives.

This alternative also includes maintenance of beach fills adjacent to inlets by means of a sand transfer plant or other authorized methods of sand by-passing. Local interests (Palm Beach County and Boca Raton) maintain sand transfer plants at Palm Beach Harbor (Lake Worth Inlet), South Lake Worth Inlet, Boca Raton Inlet, and floating dredge for transfer at Hillsboro Inlet. The viability of sand transfer at inlets by dredge has been successfully demonstrated. However, the effectiveness of fixed sand transfer plants remains to be substantiated. The alternative of providing fixed sand transfer plants at inlets has been reasonably demonstrated as a viable erosion control measure. The economic feasibility of utilizing sand transfer plants will be evaluated as a feature of beach erosion control alternatives and will be included in the evaluation of detailed plans where appropriate.

o. S-5 <u>Beach fill and periodic nourishment stabilized by groins</u>. Groins or a groin field in the problem area would help hold a beach in front of existing development and prevent further losses of land. The construction of groins would have to be supplemented with nourishment so that adjacent beaches would not be starved of sand. For this reason, groins are considered as a method to help hold the fill in place and to reduce the periodic renourishment requirements.

p. S-6 <u>Seawalls</u>. The construction of additional concrete seawalls or improvements to and maintenance of the existing bulkheads/seawall would provide a significant degree of protection; however, this would be accomplished at the expense of a recreational beach, resulting in substantial economic loss to the area. Reflecting wave energy off the existing seawalls and bulkheads has resulted in a steepening of the offshore profiles with resulting hazardous bathing conditions due to increased undertow and runouts. However, to more fully determine the effects of hardfacing the shoreline, the seawall alternative will be considered at least through the intermediate alternative evaluation phase.

q. S-7 <u>Beach fill with periodic nourishment and hurricane surge protection sand dune</u>. This alternative would help protect the shoreline from storm damages by reducing high hazard coastal flooding areas to general still water flooding areas. Measures to prevent damages from hurricane-induced surges and wave runup could be provided for a relatively high degree of protection for the oceanfront structures located along the shoreline. To provide a complete system of protection against tidal flood damages in most coastal areas is technically possible. However, such protection is generally not economically justifiable, esthetically pleasing, or socially and environmentally acceptable. This alternative has been successfully demonstrated in the Miami area and is considered a viable alternative for reducing erosion and flooding damage in other areas.

r. S-8 <u>Beach fill with periodic nourishment and hurricane surge protection - offshore breakwaters or submerged artificial reefs</u>. This alternative would essentially provide the same benefits attributed to alternative S-7 above, but the construction of offshore breakwaters or submerged artificial reefs would materially reduce the periodic nourishment quantities required to maintain project dimension size during the economic life of the project. This alternative is considered economically and technically feasible based on the demonstrated protective action of natural submerged reefs offshore of St. Lucie and Indian River Counties on the Florida east coast.

s. S-9 Nearshore berms. This alternative is similar to S-4 where dredged material from an adjacent inlet is used for shore protection. In this case however, the dredged material would be placed nearshore instead of onshore. This method is now possible due to improvements in dredging technology, allowing placement in shallow water (15 ft depth). Its low cost compared to onshore disposal could provide greater benefit. Placement will be a careful process so that hardbottom impacts will be minimized.

t. S-10 Beachfill with nearshore berms. This alternative is again similar to S-4 but will use nearshore disposal instead of onshore disposal. Use of nearshore berms will require less advance nourishment for the beachfill project.

u. S-11 Stabilization of beaches and dunes by vegetation. This alternative would provide beach grass and sand fences to the berm. The primary benefits from the provision of sand fences and beach grasses are derived from the quantity of sand saved and the ability of the works to provide stability to the berm. This alternative would result in a reduction of the quantity of periodic nourishment required. The addition of beach grass and sand fences would remove a small amount of dry beach away from recreational beach use. A variation of this alternative could be implemented at a later date in combination with beach fill if the formation of wind blown sand dunes and landward migration thereof become a problem. This has proven to be a successful alternative feature of nourishment projects in northeast Florida.

v. S-12 Feeder beach: Beach fills strategically located to nourish downdrift erosion problem areas. This concept entails utilizing disposal of maintenance dredging material, sand transfer plants, and truck hauls to provide for economical placement of material where it will nourish downdrift shores due to the predominate direction of littoral drift. Problem identification and data collection can be oriented towards providing the necessary information to formulate plans addressing this alternative on a regional perspective basis.

w. S-13 Relocation of structures. The relocation of the structures would allow the area to continue to erode and the land in this area would be lost until an equilibrium shoreline is reached. However, most structures within the area cannot be economically moved from the area which would be lost. In addition, implementation of this alternative would result in the loss of valuable recreational beach and would necessitate the condemnation of the land and structures in highly developed areas. This alternative is always considered when evaluating the cost of structural alternatives.

x. S-14 Flood proofing of structures. Flood proofing of existing structures and regulation of flood plain and shorefront development are considered part of building code modifications.

y. S-15 Abandon or modify navigation projects. All inlets could be examined to determine if modification will improve efficiency in the transfer of sand and/or maintenance of navigation works. Removal or modification of jetties, sand transfer facilities, channel alignments and/or closure could be evaluated.

z. S-16 Sand tightening of jetties. Sand tightening will decrease permeability of the jetties and decrease sand transported into inlets. This will decrease maintenance dredging requirements.

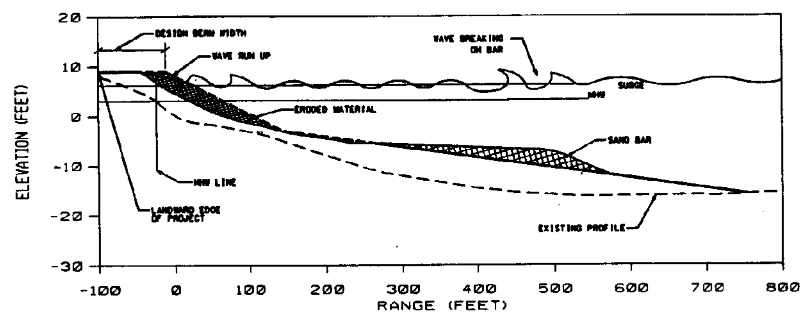
aa. S-17 Upgrading on construction of sand transfer plants for renourishment. Sand bypassing will introduce sediment into erosional areas decreasing renourishment volumes and intervals.

bb. S-18 Various combinations of above. Select features of the preceding structural solutions could be implemented collectively or in combination with the nonstructural alternatives. This alternative will therefore be carried forward int he formulation process.

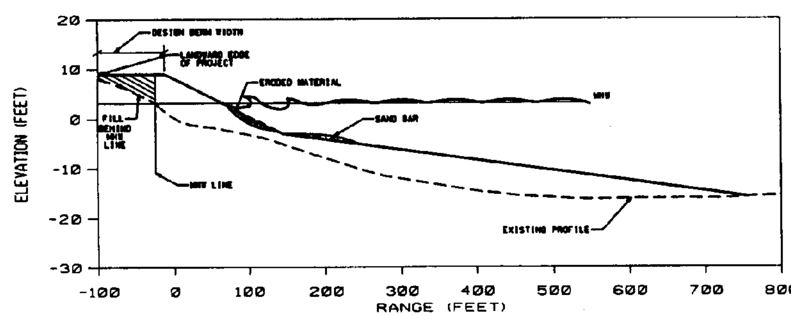
Intermediate Assessment of Alternatives

138. The previous paragraphs describing the solutions eliminated all but one non-structural and 7 structural alternatives. The no action plan (NS-1) is the single non-structural alternative to be carried throughout intermediate plan formulation for consideration and comparison. The structural alternative plans to be carried into the intermediate assessment include: beach fill with periodic nourishment (S-2) (a typical storm damage reduction project is seen in Figure 3), beach nourishment with maintenance material form updrift inlet (S-4), nearshore berms (S-9), beachfill with nearshore berms (S-10), stabilization of beaches and dunes by vegetation (S-11), abandon or modify navigation projects (S-15), sand tightening of jetties (S-16), and upgrading on construction of sand transfer plants for renourishment (S-17).

Figure 3
COAST OF FLORIDA STUDY-REGION 3



RESPONSE TO STORM WAVE CONDITIONS



RESPONSE TO NORMAL WAVE CONDITIONS

TYPICAL STORM DAMAGE REDUCTION PROJECT

139. In this phase of plan formulation, alternatives selected in the preliminary phase will be assessed using unit price cost estimates. Volumes calculated for beach fills were based on average profiles for the reach. These average profiles were developed using BMAP (Beach MorphologyAnalysis Package). Tables 11 through 13 summarizes the alternatives analyzed.

140. NED Plan Formulation. National economic development (NED) principles are utilized by the Federal government for the economic evaluation of all water resource projects. The NED principles articulate a framework to assist in making project scope and implementation decisions. For the purpose of Shore Protection in COFS, NED principles are used to determine the total net benefits of the project, both in its entirety and in incremental stages. From this information, the NED plan is formulated and net benefits are maximized.

141. The NED plan for the COFS shore protection projects has been developed in accordance with ER 1105-2-100 Section 6-1 by adopting the procedures and policies of the Water Resource Council's (WRC) Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, Chapter II - National Economic Development (NED) Benefit Evaluation Procedures (March 10, 1983).

142. NED Principles. National economic development (NED) is the increase in the net value of the national output of goods and services, expressed in monetary units. "Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the nation. Contributions to NED include increases in the net value of those goods and services that are marketed, and also those that may not be marketed."(Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, p. 1, March 1983)

143. U.S. Army Corps of Engineers projects produce outputs which benefit the nation, but these projects also expend the nation's resources. The NED principle is used to determine which utilization of the nation's resources will produce the greatest benefits to the nation. As such, the NED principle is a matter of law, policy and interpretation rather than one of economic fact or theory, although it is a policy firmly rooted in economic theory.

144. The Water Resource Council (WRC) has established evaluation principles which are intended to ensure proper and consistent planning by Federal agencies. These principles, as defined in the "Economic and Environmental

Principles and Guidelines for Water and Related Land Resources Implementation Studies", are as follows:

Various alternative plans are to be formulated in a systematic manner to ensure that all reasonable alternatives are evaluated.

(a) A plan that reasonably maximizes net national economic development benefits, consistent with the Federal objective, is to be formulated. This plan is to be defined as the NED plan.

(b) Other plans which reduce net NED benefits in order to further address other Federal, State, local, and international concerns not fully addressed by the NED plan should also be formulated.

(c) Plans may be formulated which require changes in existing statutes, administrative regulations, and established common law, such required changes are to be identified.

(d) Each alternative plan is to be formulated in consideration of four criteria: completeness, effectiveness, efficiency, and acceptability. Appropriate mitigation of adverse effects is to be an integral part of each alternative plan.

(e) Existing water and related resources plans, such as State water resources plans, are to be considered as alternative plans if within the scope of the planning effort.

145. The planning process leads to the identification of alternative plans that could be recommended or selected. The culmination of the planning process is the selection of the recommended plan or the decision to take no action. The selection should be based on a comparison of the effects of alternative plans (ER 1105-2-100 Section 5-11.a). The basis for selection of the recommended plan should be fully reported (ER 1105-2-100 Section 5-11.b(4)). In presenting the NED plan, all reports must include appropriate information and data (ER 1105-2-100 Section 5-16.b). Concise, understandable displays are also helpful during the planning process and provide documentation in compliance with NEPA (ER 1105-2-100 Section 5-9.a.1).

146. Under the NED principle, the best, or NED, plan is the one that maximizes net benefits. The Corps traditionally expresses benefits and costs in monetary terms as equivalent annual values. Thus, maximizing annual net NED benefits is formally equivalent to selecting a plan with the maximum equivalent annual benefits and maximum net present value (NPV). The plan recommending Federal action is to be the alternative plan with the greatest net economic benefit, which is also consistent with protecting the Nation's environment (Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, p. 1, March 1983).

147. Sand Transfer Plants. The obsolete sand transfer plants (STP) at Lake Worth and South Lake Worth Inlets in Palm Beach County are outdated and insufficient in passing desired volumes of sand and at sufficient discharge distance south of the respective inlets. The Lake Worth Inlet STP was in operation from 1958 to 1990. The plant was severely damaged during the winter storms of 1990 and has not been operational since that time. The Town of Palm Beach, current owner of the plant is in the process of temporarily repairing the STP to provide some bypassing capacity. The pump has been replaced and a new pipeline has been drilled under the inlet.

148. The current STP configuration at LWI does not meet the design standards outlined in the 1958 authorization. The authorized design was for bypassing 100,000 cubic yards annually to a point 1,000 to 2,000 feet south of the inlet. Current plant deficiencies are caused by the limited sand trap size of the intake location, the limited radius of 40 feet of the intake boom, and the shortened outfall pipeline on the south side of the inlet, which results in sand discharge within 200 feet of the south jetty. These limitations result in little, if any, bypass of sand beyond the influence of Lake Worth Inlet.

149. The plant facilities at Lake Worth Inlet, with the exception of the engine and discharge line under the inlet, are now almost 40 years old. Northeast storms typically flood the pump house with seawater. There are cracks in the concrete foundation of the structure housing the pump equipment. Palm Beach County, which operates the plant, has reported annual operation and maintenance costs in excess of $350,000 when in operation, not including the costs for the recent improvements. There are little or no storm damage reduction benefits for operation of the existing plant due to its limited effectiveness described above.

150. It has been assumed that the discharge line for both plants will be placed under the inlet channel by directional drilling. This is an expensive technique, thus ensuring a conservative estimate of cost for justification purposes. The pipe to be used has been specifically designed not to require rotation since it has a thickened bottom lining. The detailed design of the Lake Worth Inlet and South Lake

Worth Inlet STP's require in-depth hydraulic analyses, beyond the scope of this study, and will be determined within Feature Design Memoranda (FDM) to be prepared during PED). Other construction alternatives, including discharge pipe routing and placement to reduce cost, will be considered during this phase.

151. In the 1988 Section 111, Definite Project Report, Palm Beach Harbor, Florida, it was determined that 45 percent of erosion downdrift of Lake Worth Inlet is directly attributable to the Palm Beach Harbor Navigation Project. This feasibility study has found that the erosion caused by the project is 67 percent (based on data and analysis in Appendix D). Cost-sharing will be based on mitigation for this increased erosion. South Lake Worth Inlet also has an adverse affect on downdrift shoreline, however, a Federal navigation project does not exist at that inlet.

Description of Intermediate Alternatives

152. Palm Beach County. Jupiter/Carlin. This 1.1 mile beachfill project located between DEP monuments R-13 and R-19 is authorized but as yet unconstructed. The optimal berm width is 20 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 513,000 cubic yards and the renourishment interval is 7 years. Two potential nearshore berm sites have been identified. However one site was eliminated due to the close proximity of a proposed borrow area. A potential dune component of the project will be analyzed further in the next report. An example of the methodology for the optimization of the berm width and nourishment interval will be discussed in the next section of the report, "Economics of Alternatives".

153. Riviera. The storm protection plan for this segment of Palm Beach County includes the construction of 5 offshore breakwater segments. This plan is being designed and proposed for the county by a consulting firm and is shown in Figure 4. The breakwaters will be constructed on top of existing hardbottom and as such would require the placement of armor stone only. Armor stone density would be 145 pcf, weight 7,000 lbs, and about 4 cubic feet in dimension. Considered breakwater lengths are 180 feet, 200 feet, 180 feet, 180 feet, and 200 feet. The breakwaters will be located about 1 to 1 1\2 miles north of Lake Worth Inlet (DEP monuments R-67 to R-69) and serve as an extension to a shallow hardbottom area which is shore-connected at the northern end. The breakwaters will be between about 150 to 375 feet offshore.

154. Riviera. This 1.7 mile new project area has a wide beach but is at a low elevation. A dune project is proposed and will be examined in detail in the next report for the area between DEP monuments R-66 and R-75. One potential nearshore berm site has been identified.

155. Lake Worth Inlet. The recommended plan for sand bypassing at Lake Worth Inlet (R-75-78) requires the construction of a new fixed pumping plant located north of the inlet. The bypassing plant includes:

a. A deposition area north of the north jetty,

b. An array of jet pumps suspended from a pier oriented perpendicular to the shoreline, or

c. A single jet pump deployed by a crane from the north jetty,

d. A clear water pump and pipeline providing water to the jet pumps,

e. An on shore pumphouse containing the clear water pump and a booster pump for transferring the dredged material past the inlet,

f. A slurry pit to ensure the proper ratio of solids to water, and

g. All associated pipe, valves, instruments, and controls required for operation of the system.

The discharge point for sand bypassing would be about 2,500 feet south of the south jetty. The system would be designed for a target bypassing rate of about 160,000 cubic yards per year. The detailed design for deployment of the jet pump eductors (whether pier or jetty) would be determined within a Feature Design Memorandum (FDM).

156. North Palm Beach Island. The 1.9 mile beach fill project located between DEP monuments R-76 and R-85 is authorized but as yet unconstructed. The optimal berm width is 20 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 468,000 cubic yards and the renourishment interval is 9 years. Mitigation for hardgrounds may be necessary in this area.

157. Palm Beach Island. The 2.7 mile beach fill project located between DEP monuments R-91 and R-105 is authorized but as yet unconstructed. The optimal berm width is 20 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW

TABLE 11
PALM BEACH COUNTY - INTERMEDIATE PROJECT AREAS OF INTEREST
COAST OF FLORIDA STUDY - REGION III

POTENTIAL PROJECT	FDEP RANGE	PROJECT LENGTH	COMMENTS
1. JUPITER/JUNO Beach Fill and Dune; Nearshore Berm	R-13 - R-29	3.0 miles	Authorized Project, not constructed
2. RIVIERA Stablize Beach with Groin or Breakwater	R-67 - R-69	0.38 miles	New Project
3. RIVIERA Dune; Nearshore Berm	R-66 - R-75	1.7 miles	New Project
4. LAKE WORTH INLET Sand Transfer Plant	R-75 - R-78	0.57 miles	New Project
6. N. PALM BEACH ISLAND Beach Fill; Nearshore Berm	R-76 - R-85	1.9 miles	Authorized Project, not constructed
7. PALM BEACH ISLAND Beach Fill; Nearshore Berm	R-91 - R-105	2.7 miles	Authorized Project, not constructed
8. S. PALM BEACH ISLAND Beach Fill	R-116 - R-132	3.0 miles	Authorized Project, not constructed
9. S. LAKE WORTH INLET Sand Transfer Plant	R-151 - R-154	0.57 miles	New Project
10. OCEAN RIDGE Beach Fill; Nearshore Berm	R-152 - R-159	1.46 miles	Authorized Project, not constructed
11. DELRAY BEACH Beach Fill; Nearshore Berm	R-175 - R-188	2.65 miles	Authorized Project
12. HIGHLAND BEACH Beach Fill; Nearshore Berm	R-188 - R-205	3.2 miles	New Project
13. BOCA RATON Beach Fill; Nearshore Berm	R-205 - R-213	1.45 miles	Authorized Project

TABLE 12
BROWARD COUNTY - INTERMEDIATE PROJECT AREAS OF INTEREST
COAST OF FLORIDA STUDY - REGION III

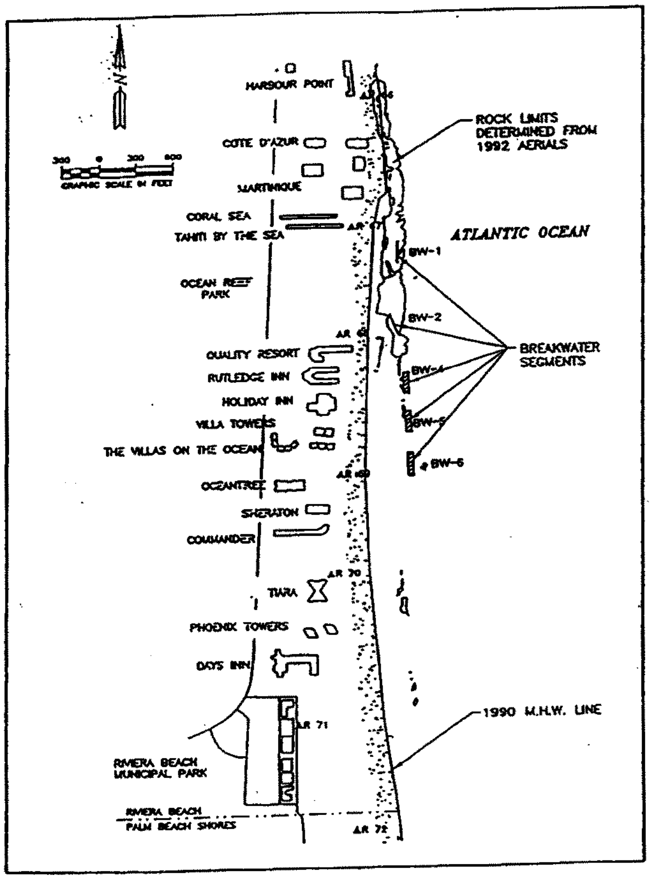
POTENTIAL PROJECT	FDEP RANGE	PROJECT LENGTH	COMMENTS
1. DEERFIELD BEACH Beach Fill	R-1- R-25	4.5 miles	New Project
2. HILLSBORO INLET Sand Trap Groin or Breakwater	R-25 - R-26	1000 feet	New Project
3. POMPANO, UNINC, LAUD.-BY-THE SEA Beach Fill; Nearshore Berm	R-26 - R-53	5.3 miles	Authorized Project
4. FORT LAUDERDALE Beach Fill; Dune; Nearshore Berm	R-53 - R-64	2.1 miles	New Project
5. PORT EVERGLADES Sand Transfer Plant	R-85 - R-88	0.57 miles	New Project
6. PORT EVERGLADES Spur and Breakwater	R-86	600 feet	New Project
7. J.U. LLOYD Beach Fill; Nearshore Berm	R-86 - R-98	2.3 miles	Authorized Project
8. DANIA Beach Fill	R-98 - R-101	0.6 miles	New Project
9. HOLLYWOOD/ HALLANDALE Beach Fill; Nearshore Berm	R-101 - R-128	5.3 miles	Authorized Project, not constructed

TABLE 13
DADE COUNTY - INTERMEDIATE PROJECT AREAS OF INTEREST
COAST OF FLORIDA STUDY - REGION III

POTENTIAL PROJECT	FDEP RANGE	PROJECT LENGTH	COMMENTS
1. GOLDEN BEACH Beach Fill	R-1- R-7	1.1 miles	New Project
2. SUNNY ISLES Beach Fill; Nearshore Berm	R-7 - R-20	2.5 miles	Authorized Project
3. BAKERS HAUL. INLET Sand Transfer Plant	R-26 - R-29	0.58 miles	New Project
4. BAL HARBOUR SURFSIDE, MIAMI BEACH Beach Fill; Dune; Nearshore Berm	R-27 - R-74	8.9 miles	Authorized Project
5. GOVERNMENT CUT Sand Tightening	R-74 - R-75	0.19 miles	New Project
6. KEY BISCAYNE Beach Fill and Dune	R-96 - R-113	3.2 miles	Authorized Project

FIGURE 4

RIVIERA BREAKWATER DESIGN
COAST OF FLORIDA STUDY - REGION III



BREAKWATER DESIGN PLAN VIEW

and 1:30 from MLW to existing bottom. The initial design volume is 994,000 cubic yards and the renourishment interval is 8 years. Three potential nearshore berm sites have been identified. However one site was eliminated due to possible wave focusing effects. Mitigation for hardgrounds may also be necessary in this area

158. South Palm Beach Island. The three mile beach fill project located between DEP monuments R-116 and R-132 is authorized but as yet unconstructed. The optimal berm width is 20 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 800,000 cubic yards and the renourishment interval is 6 years.

159. Ocean Ridge. The 1.5 mile beach fill project located between DEP monuments R-152 and R-159 is authorized but as yet unconstructed. The optimal berm width is 60 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 462,000 cubic yards and the renourishment interval is 8 years. Two potential nearshore berm sites have been identified, but were eliminated.

160. Delray Beach. The 2.6 mile beach fill project located between DEP monuments R-175 and R-188 is authorized and constructed. The optimal berm width in the re-analysis of this project is 20 feet at elevation +9.0 feet NGVD and slopes of 1:20 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 962,000 cubic yards and the renourishment interval is 10 years. One potential nearshore berm site has been identified.

161. Highland Beach. the 3.2 mile beach fill project located between DEP monuments R-188 and R-205 is a newly developed project. It would fill in a gap between two authorized projects lessening end losses. The optimal berm width in the analysis of this project is 25 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 782,000 cubic yards and the renourishment interval is 10 years. One potential nearshore berm site has been identified.

162. Boca Raton. The 1.5 mile beach fill project located between DEP monuments R-205 and R-213 is authorized and constructed. The optimal berm width in the re-analysis of this project is 20 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:35 from MLW to existing bottom. The initial design volume is 484,000 cubic yards and the renourishment interval is 8 years. One potential nearshore berm site has been identified.

163. Broward County. Deerfield Beach. The 4.5 mile beach fill project located between DEP monuments R-1 and R-24 is a newly developed project. The optimal berm width in the analysis of this project is 20 feet at elevation +9.0 feet NGVD and slopes of 1:15 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 1,782,000 cubic yards and the renourishment interval is 8 years.

164. Hillsboro Inlet. Navigation improvements are being considered for the outer channel at this inlet to provide advanced maintenance for the entrance channel. Two alternatives are being evaluated. The first is as designed and contained within a permit request by the local sponsor which proposes to dredge a fan/delta shaped entrance channel extending from the eastern limits of the existing jetties to the minus 15-foot contour, NGVD, a distance of about 1,550 feet. the seaward side of the new channel would be approximately 1,000 feet and the proposal is to dredge to minus 20 feet, NGVD, with a 2-foot over dredge allowable. About 75,000 and 140,100 cubic yards of sand and rock, respectively would be removed. Excavated sand would be placed wither on the beach within 2,000 feet south of the inlet (R-25 to R-27) or within a near-shore reach located about 4,000 to 6,000 feet south of the inlet (R-29 to R-31). The rock removed would be placed on an existing artificial reef approximately 3.75 miles north of the inlet in waters 60 to 70 feet deep (large diameter rocks) and 350 to 400 feet deep (small diameter rocks). The second navigation alternative would consist of deepening the existing locally maintained 200 foot wide entrance channel to -15 feet MLW extending from the eastern limits of the existing jetties to the -15 foot MLW contour. The depth of the widener would also be -15 feet MLW. Material removed would include about 80,100 cubic yards of sand and 23,250 cubic yards of rock. Disposal options would be identical to the first alternative.

165. Pompano/Lauderdale-By-The-Sea. The 5.3 mile beach fill project located between DEP monuments R-24 and R-53 is authorized and constructed. The optimal berm width in the re-analysis of this project is 20 feet at elevation +9.0 feet NGVD and slopes of 1:15 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 1,917,000 cubic yards and the renourishment interval is 7 years. One potential nearshore berm site has been identified.

166. Fort Lauderdale. This 2.1 mile new project area is at a low elevation and experiences flooding during storms. A dune project is proposed and will be examined in detail in the next report for the area between DEP monuments R-53 and R-64. A beach fill will be analyzed in conjunction with the dune. One potential nearshore berm site has been identified but was eliminated due to the potential for wave focusing.

167. Port Everglades. The recommended plan for sand bypassing at Port Everglades (R-85-88) requires the construction of a fixed pumping plant similar to Lake Worth Inlet located north of the inlet. This discharge point for sand bypassing would be about 1000 feet south of the south jetty.

168. Port Everglades. The inlet management plan for Port Everglades recommended the construction of two structures immediately south of the port's south jetty. The design includes a 150 foot jetty spur structure connected to the south side of the Port Everglades south jetty at an angle which is approximately parallel to the historical shoreline south of the inlet. In addition, a 300 foot long breakwater would be constructed along the same alinement as the jetty spur with a 150 foot gap between the spur and the breakwater. The jetty spur would be a rubble mound structure with a core, intermediate, and armor layers with a crest elevation of about +8.0 feet. The armor would be granite of a weight of 8 to 10 tons. Similarly, the detached breakwater would be similar structure but would only consist of layers of armor stone of 6 to 10 tons to an elevation of +5.0 feet. These structures are designed to reduce the chronic erosion immediately south of the harbor by disrupting the circulation patterns due to tidal associated with currents.

169. J.U. Lloyd. The 2.3 mile beach fill project located between DEP monuments R-86 and R-98 is authorized and constructed. The optimal berm width in the re-analysis of this project is 20 feet at elevation +10.0 feet NGVD and slopes of 1:15 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 1,032,000 cubic yards and the renourishment interval is 5 years. One potential nearshore berm site has been identified.

170. Dania. The .6 mile beach fill project located between DEP monuments R-98 and R-101 is newly developed. A beach fill at Dania would fill in the gap between J.U. Lloyd and Hollywood/ Hallandale, two authorized projects. However, due to the small project length, the fill would be designed as a transition. The optimal berm width would transition between 20 and 45 feet with a transition berm height between elevation +10.0 feet and +7.0 NGVD and slopes of 1:15 berm to MLW and 1:40 from MLW to existing bottom.

171. Hollywood/Hallandale. The 5.3 mile beach fill project located between DEP monuments R-101 and R-128 is authorized and constructed. The optimal berm width in the re-analysis

of this project is 45 feet at elevation +7.0 feet NGVD and slopes of 1:15 berm to MLW and 1:45 from MLW to existing bottom. the initial design volume is 1,458,000 cubic yards and the renourishment interval is 7 years. One potential nearshore berm site has been identified.

172. Dade County. Golden Beach. The 1.1 mile beach fill project located between DEP monuments R-1 and R-7 is a newly developed project. It would fill in a gap between two authorized projects (in two different counties) decreasing end losses. The optimal berm width in the analysis of this project is 70 feet at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 408,000 cubic yards and the renourishment interval is 6 years. Two potential nearshore berm sites have been identified. One has been eliminated due to potential wave focusing.

173. Sunny Isles. The 2.5 mile beach fill project located between DEP monuments R-7 and R-20 is authorized and constructed. The optimal berm width in the re-analysis of this project is 40 feet at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 607,000 cubic yards and the renourishment interval is 4 years. One potential nearshore berm site has been identified.

174. Bakers Haulover Inlet. The recommended plan for sand bypassing at Bakers Haulover Inlet (R-26-29) requires the construction of a fixed pumping plant similar to Lake Worth Inlet located north of the inlet. The discharge point for sand bypassing would be about 1000 feet south of the south jetty.

175. Bal Harbour, Surfside, Miami Beach. The 8.9 mile beach fill project located between DEP monuments R-27 and R-74 is authorized and constructed. The optimal berm width in the re-analysis of this project is 60 feet at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 3,732,000 cubic yards and the renourishment interval is 3 years. Four potential nearshore berm sites has been identified. The dune component of this project will be analyzed in the next report.

176. Government Cut. To sand tighten the north jetty (R-74, excavation will be required to construct a stable foundation for the increased width of the rebuilt cross-section. Excavation will be required to either -4 feet MLW, or until buried armor stone is encountered, whichever occurs first. If no armor stone is encountered, an 18-inch bedding layer will be placed, and armor stone will be placed in a layer at least 2 stones thick. The displaced armor stone will be used first, then supplemented by 1,980 tons of new 2-ton armor stone (165 lb/ft 3 minimum). The armor layer above the core will be chinked and grouted also, in order to create an impermeable barrier to elevation +12.0 MLW. The final crest width will be 15 feet, at an elevation of +12 feet MLW. Side slopes will be 1 vertical on 1.5 horizontal. The total quantities of new materials are as follows:

a. Displaced Existing Armor Stone. Approximately 4,465 tons of existing armor stone will be excavated and stockpiled next to the jetty, then replaced as the structure is rebuilt.

b. New Armor Stone. Assuming 165 lb/ft3 minimum unit weight, 25 percent voids, and 10 percent waste, 1,980 tons of new 2-ton armor stone will be required.

c. New Bedding/Core/Chinking Stone. This type of stone will be used in four areas: placement below MLW along the excavated jetty centerline, construction of a foundation at -4 feet MLW to support the increased width of the jetty, construction of the sand-tight core, and chinking above the core. Locally available stone may be used. Assuming a unit weight of 140 lb/ft3, plus 10 percent waste, 374 tons will be required to construct the foundation layer for the new armor stones. An additional 410 tons of stone will be placed to -3 feet MLW by pressure-washing. Construction of the impermeable core will require 1,852 tons, and chinking above the core will require 315 tons. Total weight of stone required is 2,951.

177. Key Biscayne. The 3.2 mile beach fill project located between DEP monuments R-96 and R-113 is authorized and constructed. The optimal berm width in the re-analysis of this project is 45 feet at elevation +5.3 feet NGVD and slopes of 1:14 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 332,000 cubic yards and the renourishment interval is 5 years. A potential dune component of this project will be considered in the next report.

178. Two structural alternatives, Riviera Groin or Breakwater (R-67-69) and Port Everglades spur and breakwater (R-86) analyzed during the intermediate assessment of alternatives were determined to be beyond the scope of this study. They will not be further analyzed. Two sand transfer plant alternatives, Port Everglades (R-85) and Bakers Haulover Inlet (R-26) were also not studied further due to the inadequate supply of sediment to transfer. The sediment budget for these two inlets are discussed in Appendix D.

179. The beach fill alternative at Riviera (R-66-75) was determined to be unfavorable due to its localized nature. The erosional hot spot covers a very small portion of the project area. Periodic nourishment is authorized and should be used to fill in the hot spot as it occurs.

DETAILED ALTERNATIVE PLANS

180. In the final phase of plan formulation, the development and assessment of detailed alternative plans is undertaken. Detailed benefits have been computed. MCACES cost estimates, including the costs of lands, easements, rights-of-way and mitigation, have also been computed. This detailed information may be found in Appendix D.

Detailed Assessment of the No Action Plan

181. This alternative assumes that the erosion in the study area will continue with no solutions or remedial measures being constructed, except for those in response to emergency situations. Local efforts to stop the storm and erosion damage have been limited to construction and repair of coastal armor. These efforts have not provided the desired level of storm protection.

182. This option avoids any undesirable effects that may be associated with construction of the selected plan. However, if steps are not taken to counteract the erosion and provide an appropriate level of storm damage protection, continuing erosion and recession of the shoreline will occur with subsequent loss of valuable property and damage to structural improvements along the shoreline. A summary of environmental impacts of the no action plan is presented in the Environmental Impact Statement which follows the main text of this report.

Description of Detailed Alternatives

183. Detailed alternatives are described in the following section in geographic order from north to south. The discussion is grouped by littoral cell (beach reaches between two inlets), generally considered as a project segment. In those cases where two counties are involved within the same littoral cell, i.e., Boca Raton Inlet to Hillsboro Inlet and Port Everglades Inlet to Bakers Haulover Inlet, the project alternatives are discussed on a county basis.

184. Figures 5 - 8 illustrate the various project segments and project components on a regional scale. Figures 9 - 22 illustrate the recommended project footprints at a more detailed scale also illustrating identified nearshore

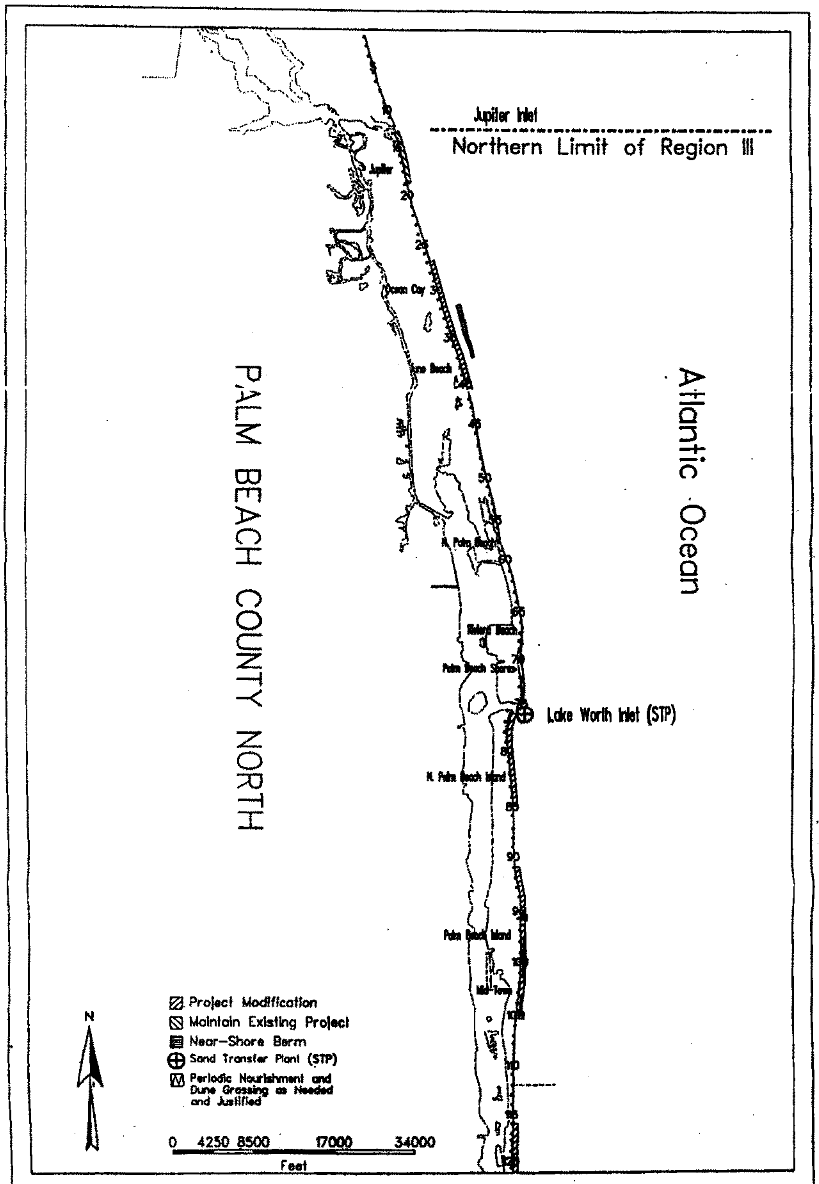


Figure 5 Palm Beach County Project Alternatives, North

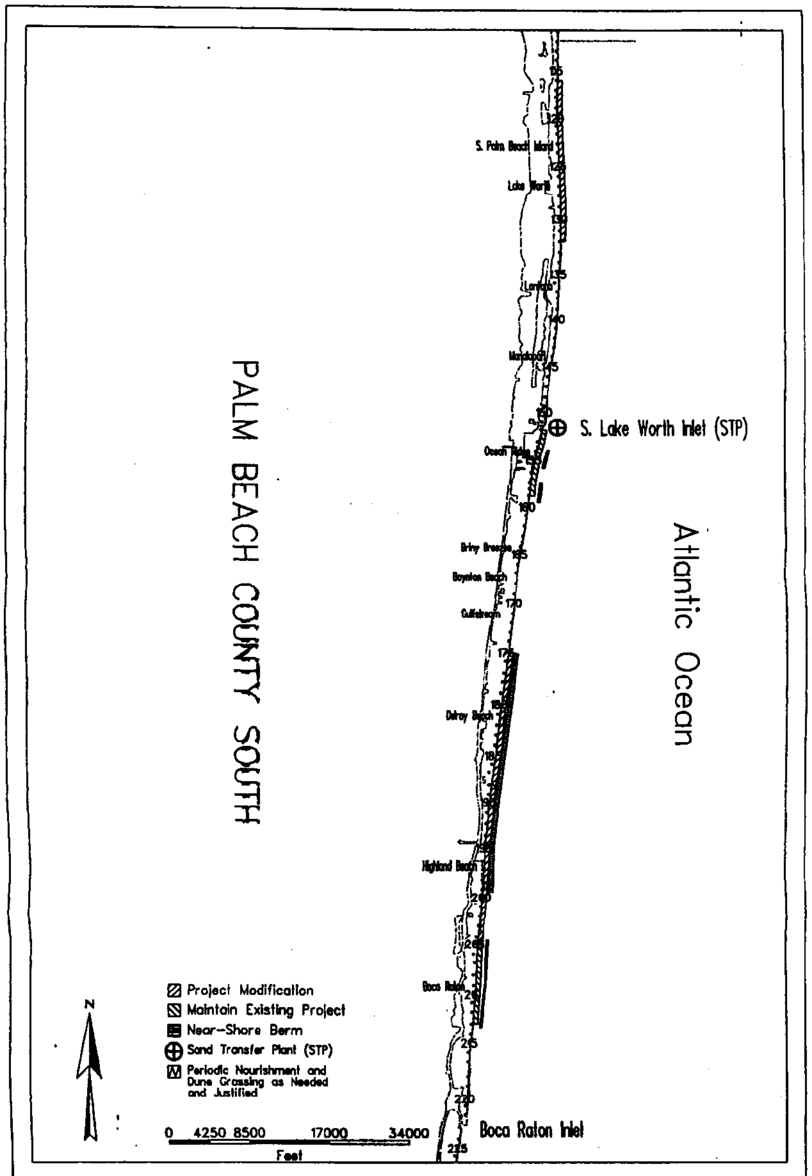


Figure 6 Palm Beach County Project Alternatives, South

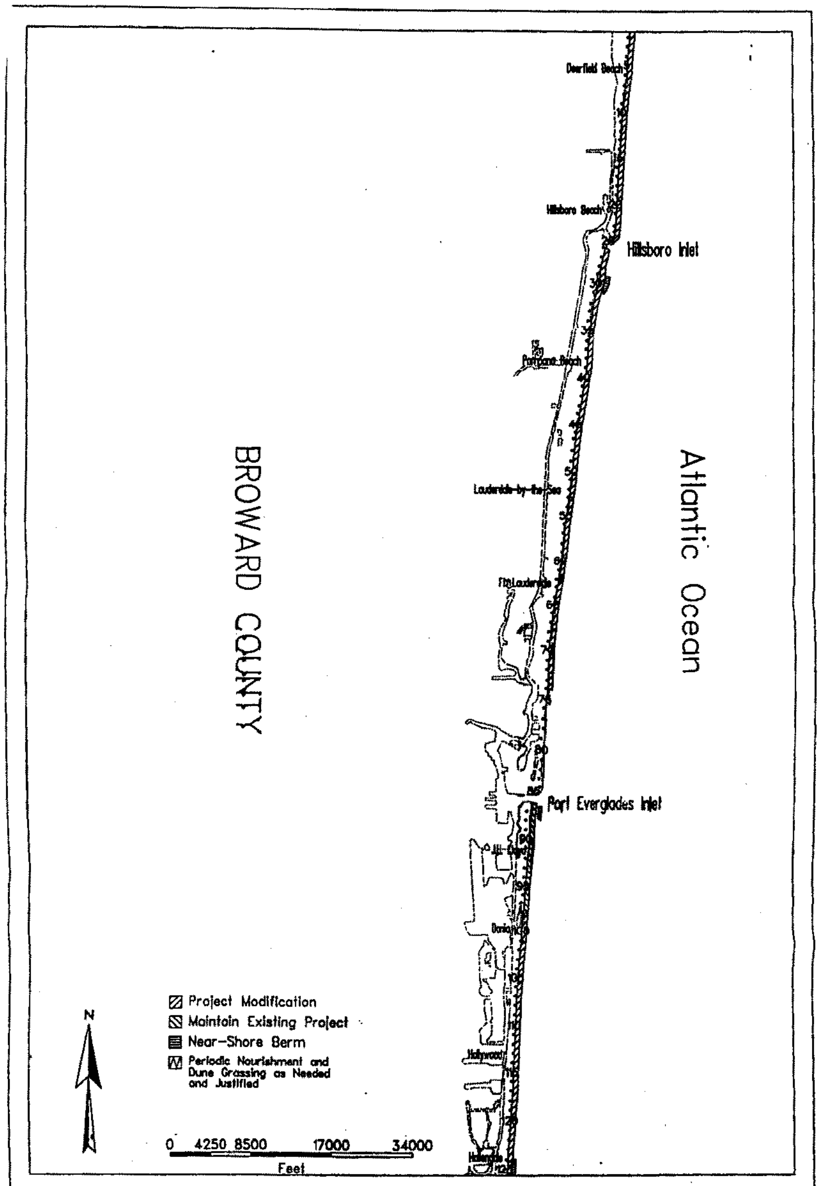


Figure 7 Broward County Project Alternatives

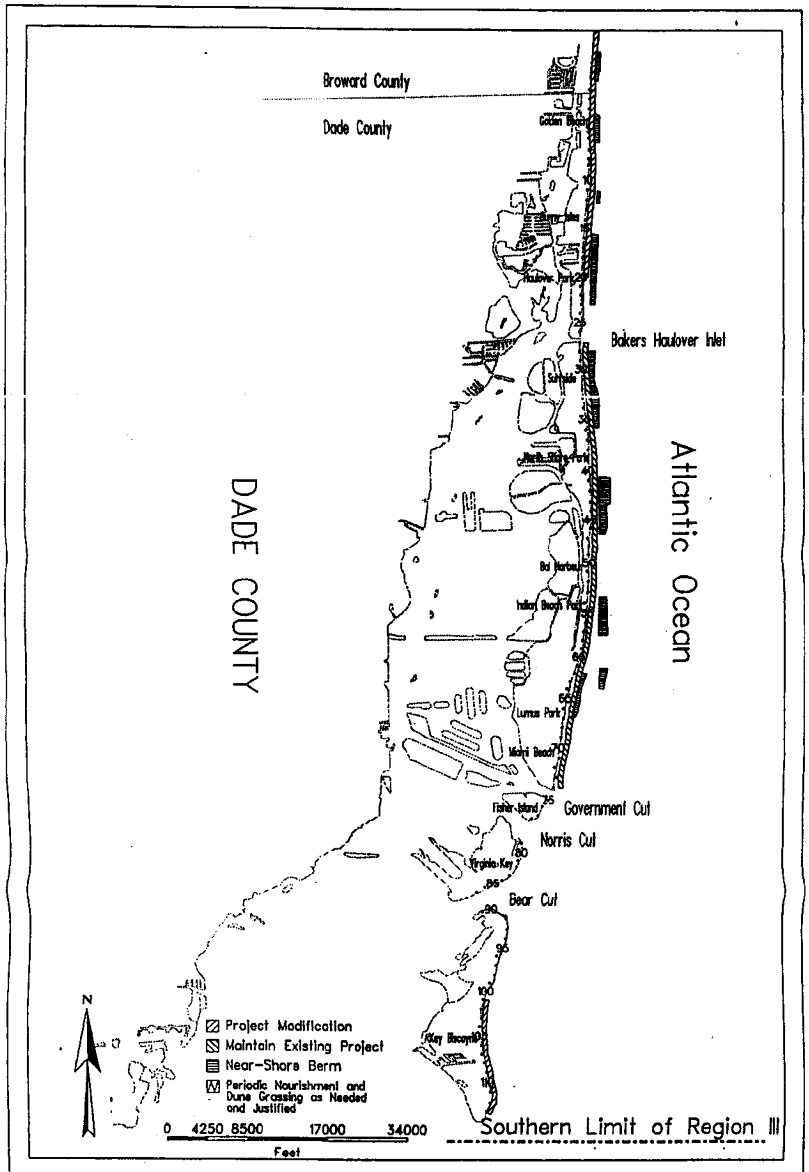


Figure 8 Dade County Project Alternatives

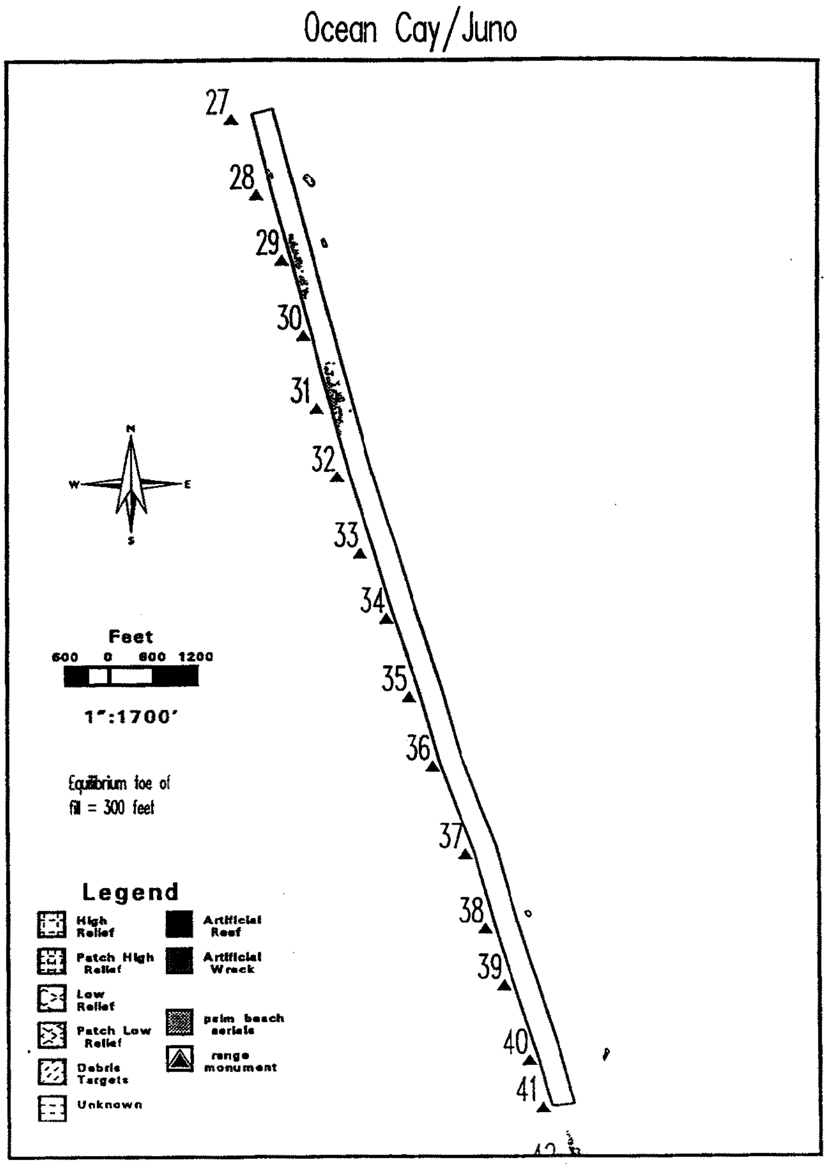


Figure 9 Ocean Cay/Juno Project Footprint

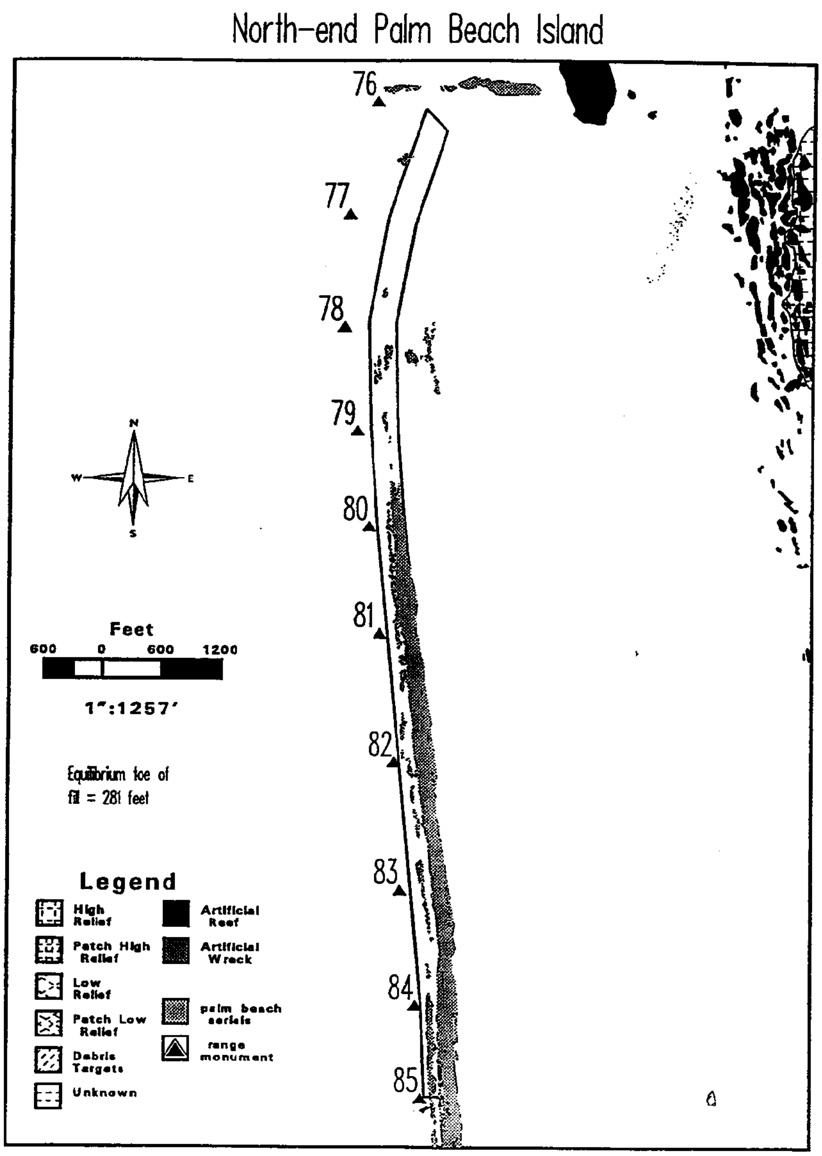


Figure10 Northend Palm Beach Island Project Footprint

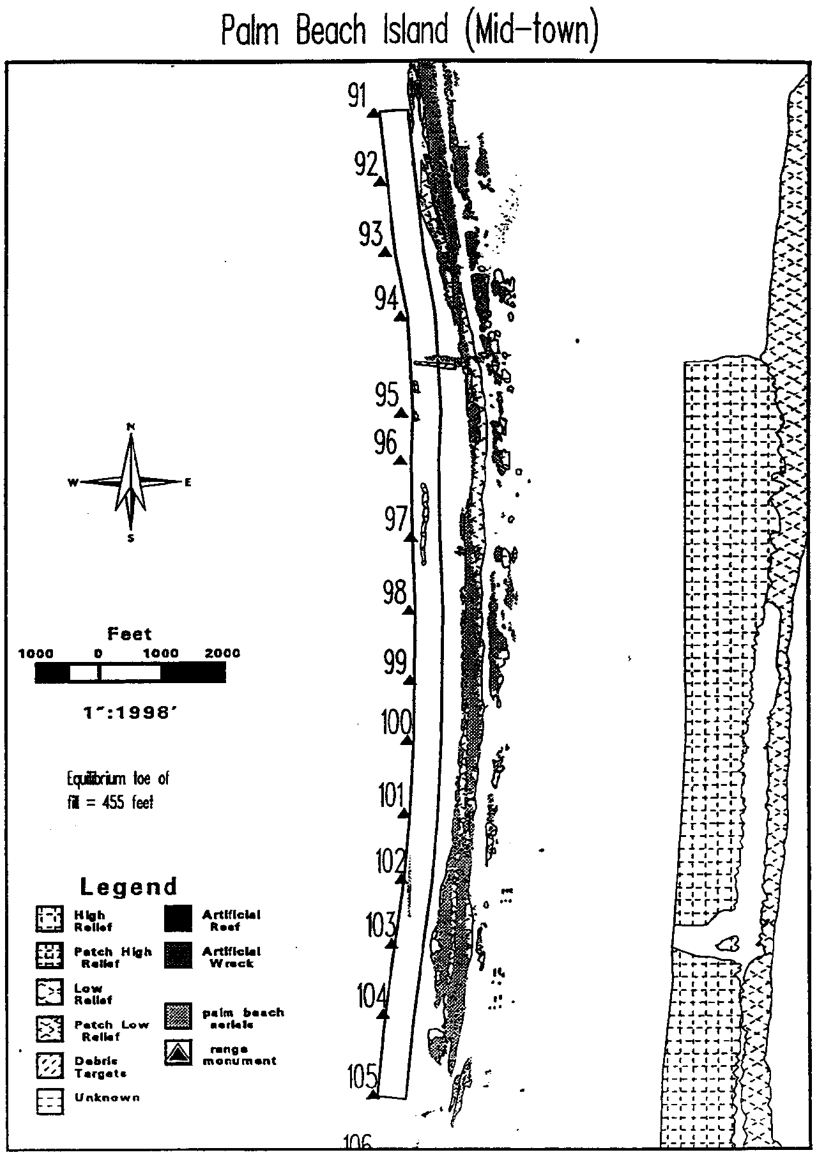


Figure 11 Palm Beach Island (Midtown) Project Footprint

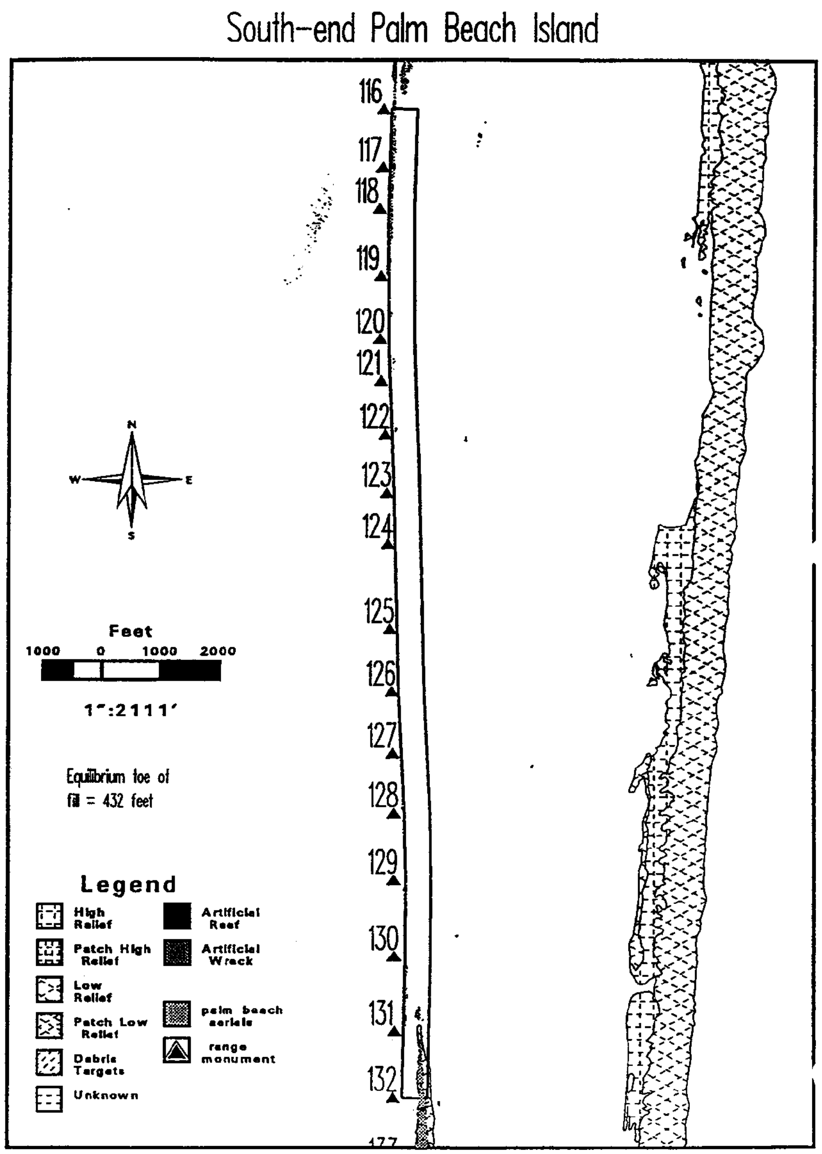


Figure 12 Southend Palm Beach Island Project Footprint

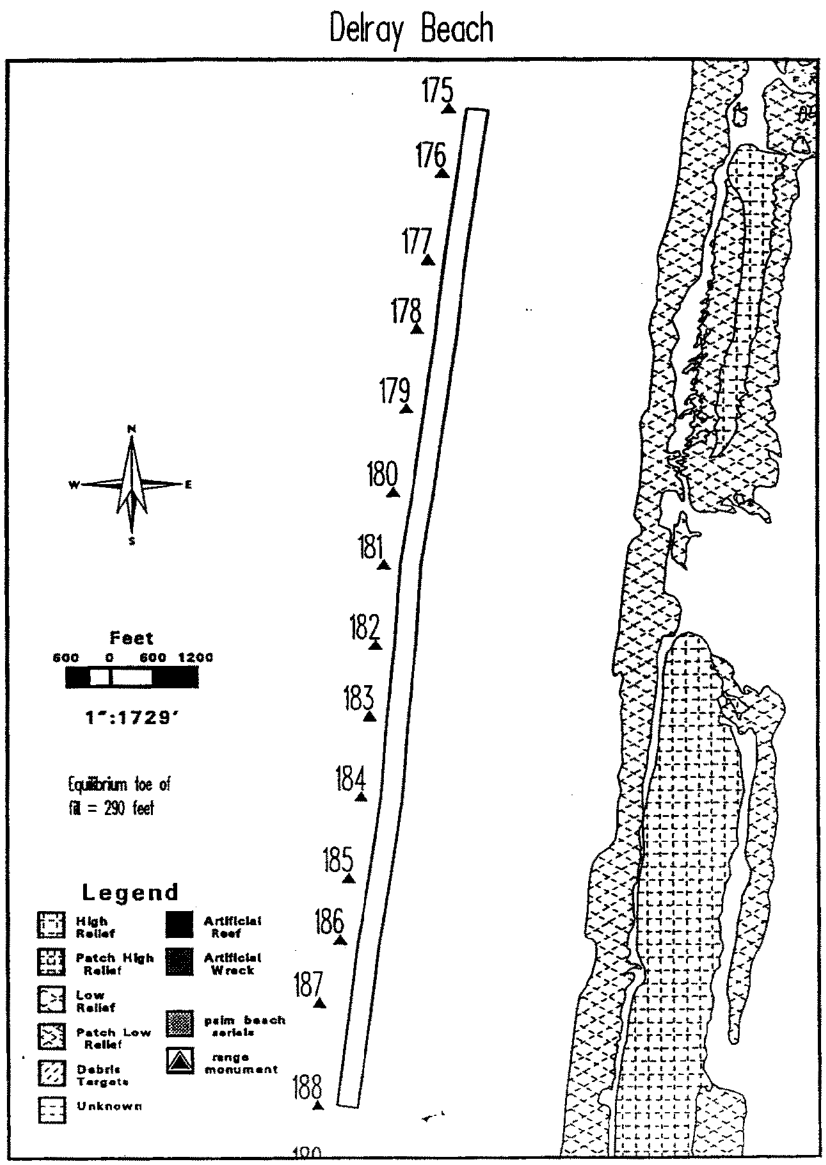


Figure 13 Delray Beach Project Footprint

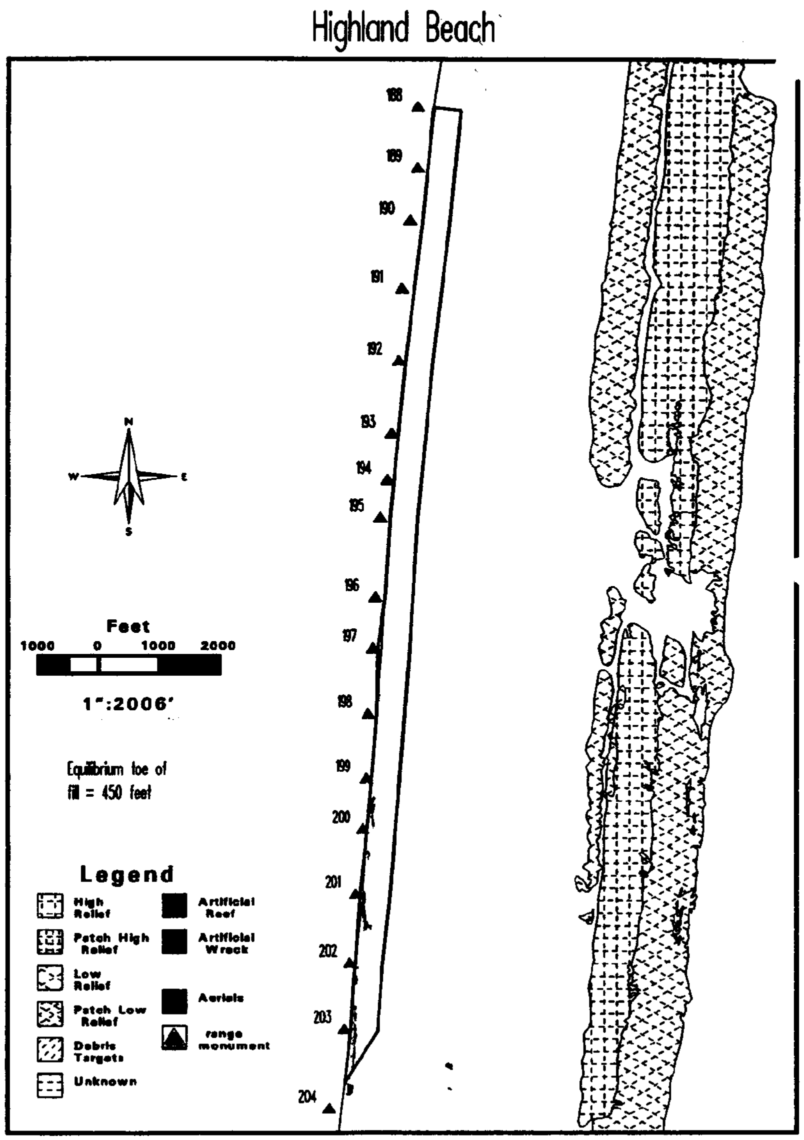


Figure 14 Highland Beach Project Footprint

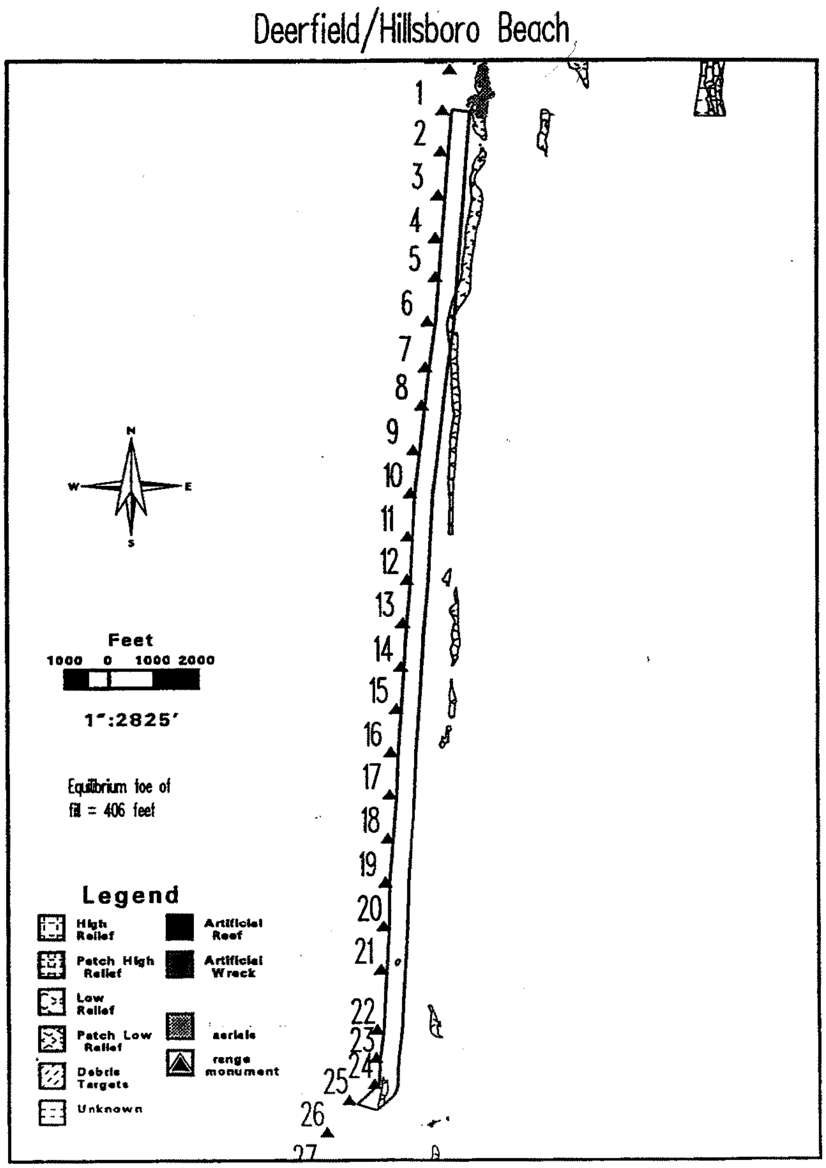


Figure 15 Deerfield/Hillsboro Beach Project Footprint

Pompano/Lauderdale-By-The-Sea

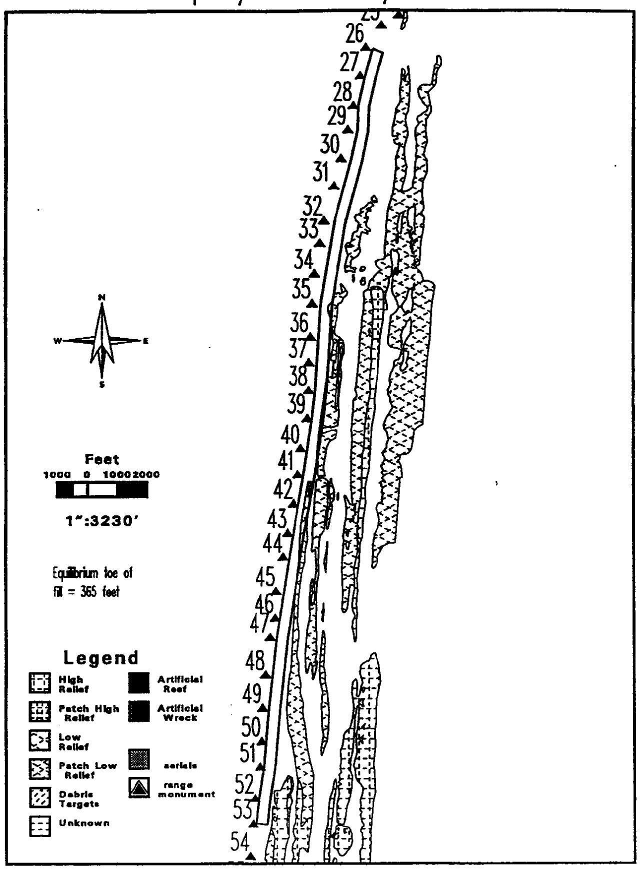


Figure 16 Pompano/Lauderdale-By-The-Sea Project Footprint

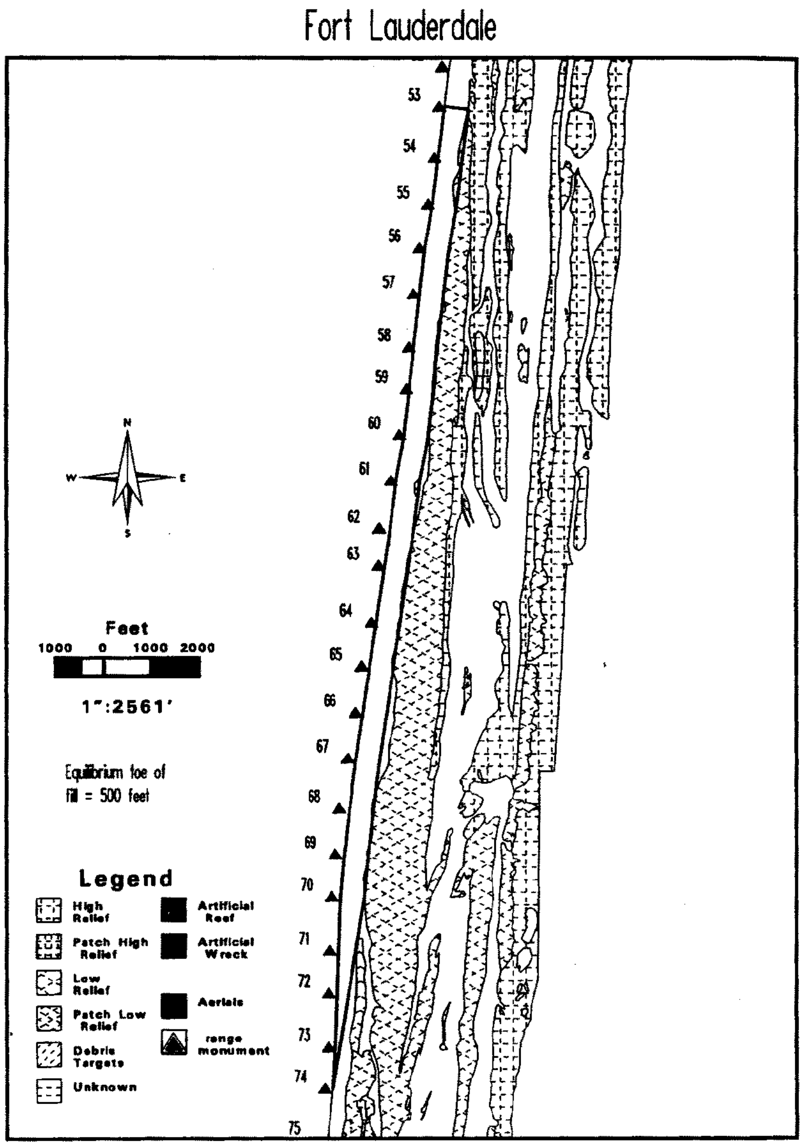


Figure 17 Fort Lauderdale Project Footprint

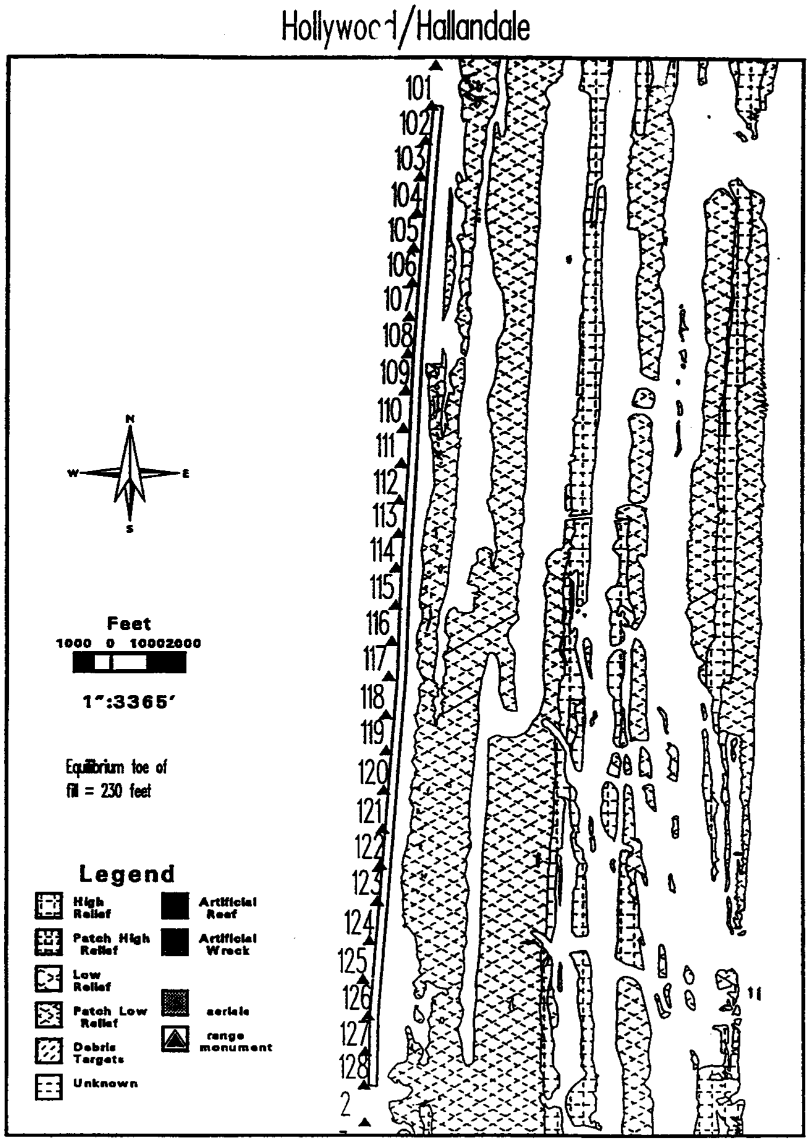


Figure 18 Hollywood/Hallandale Project Footprint

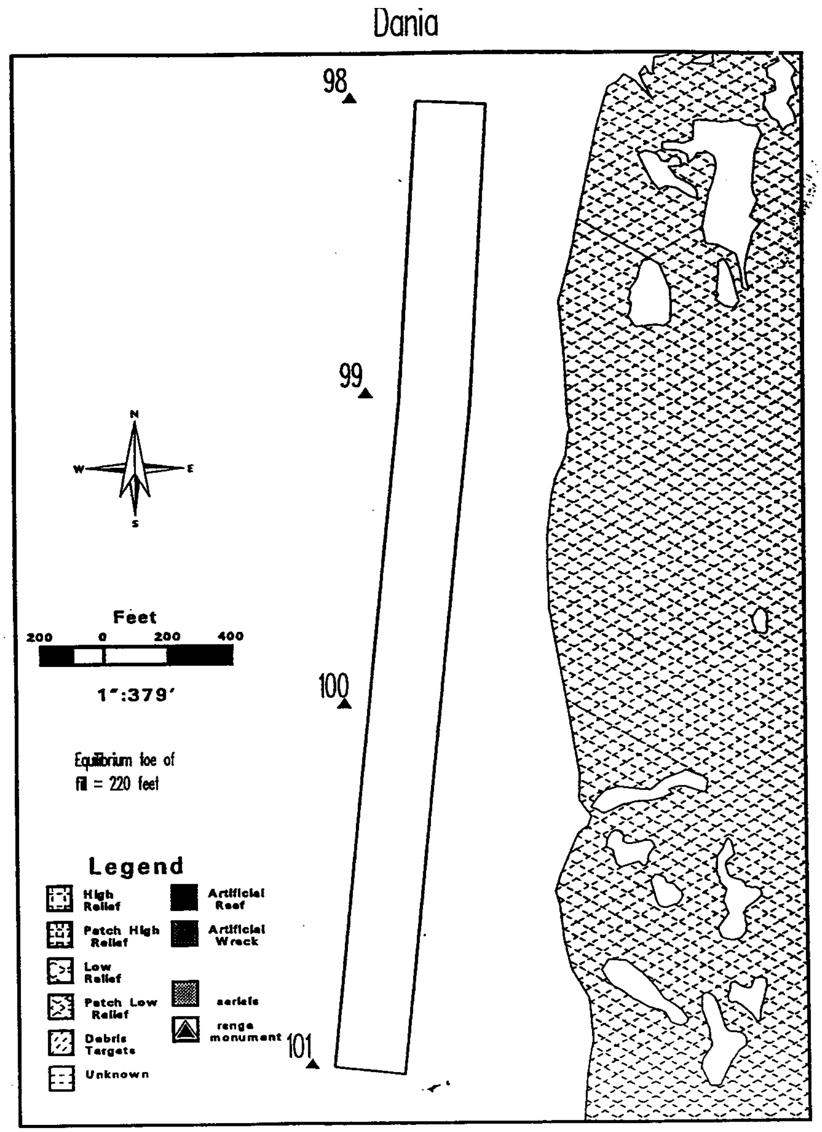


Figure 19 Dania Project Footprint

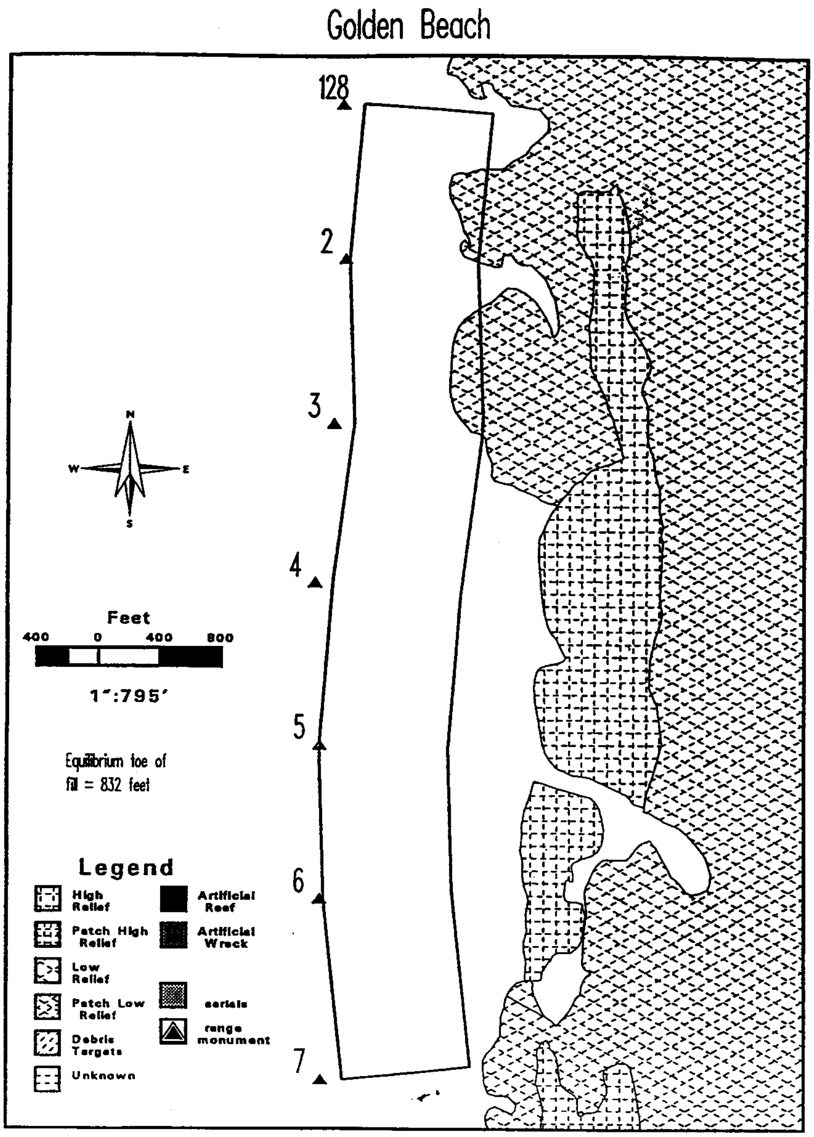


Figure 20 Golden Beach Project Footprint

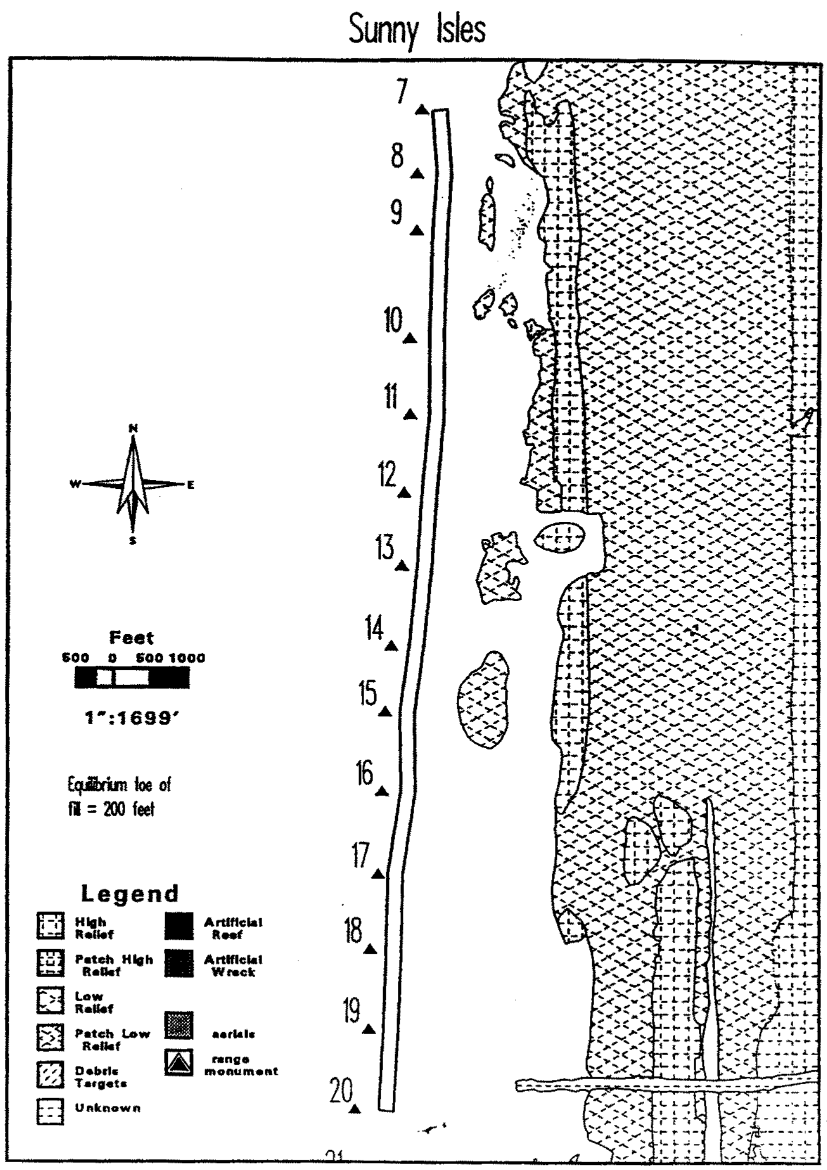


Figure 21 Sunny Isles Project Footprint

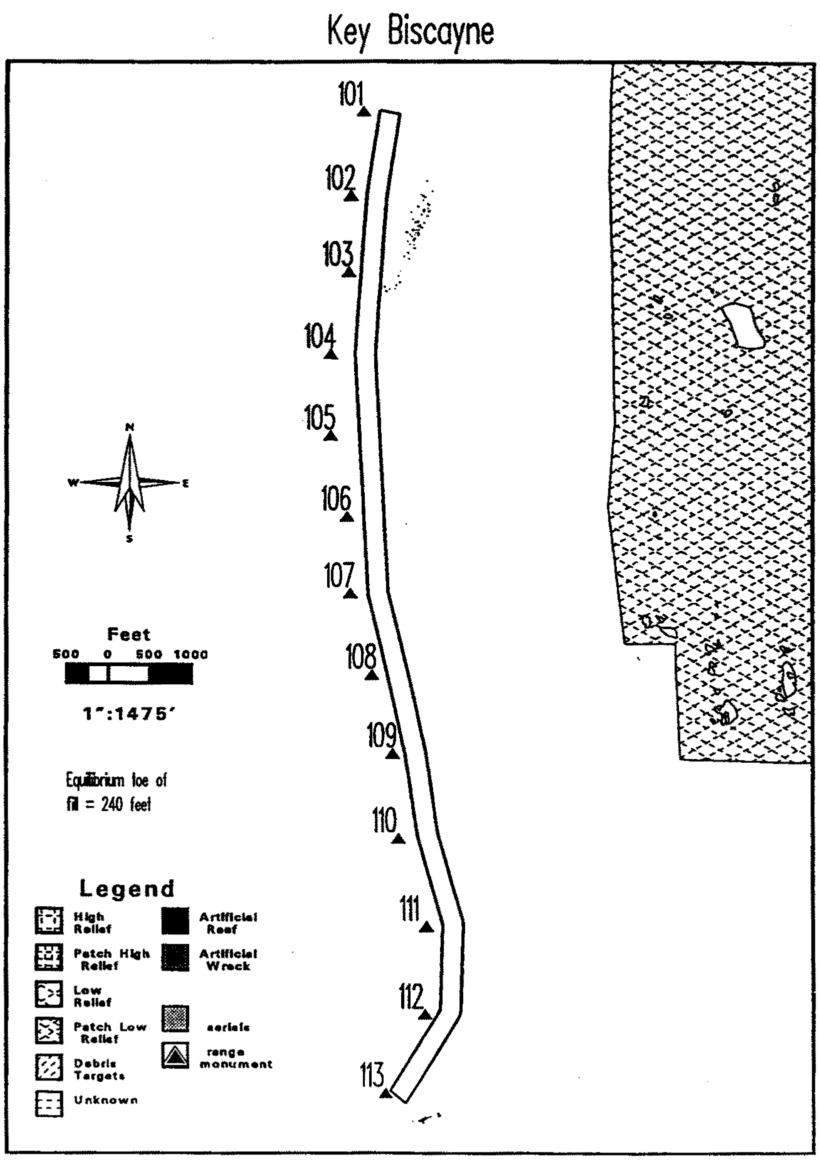


Figure 22 Key Biscayne Project Footprint

hardgrounds. Mitigation for impacts to hardgrounds have been incorporated into the MCACES cost estimates in Appendix D.

PALM BEACH COUNTY

Jupiter Inlet to Lake Worth Inlet Project Segment:

185. Jupiter/Carlin. This existing 1.1 mile beach restoration and periodic nourishment project component is located between DEP monuments R-13 and R-19. The project consists of a beach restoration with a seven year nourishment interval. Initial construction of this project was completed during April 1995. Extension of Federal participation from 10 years from completion of construction to 50 years from the start of construction is recommended. Nearshore berms are not feasible in association with this project area due to the presence of nearshore hardgrounds.

186. Ocean Cay/Juno. This 2.75 mile project component is currently authorized for periodic nourishment as needed and justified. The recommended modification includes adding initial restoration by construction of a design beach with a 55 foot berm, and periodic nourishment between DEP monuments R-27 and R-41. The renourishment interval is seven years. The equilibrium toe of fill, including initial fill plus advance nourishment, is 300 feet. Mitigation for approximately 1.7 acres of hardground impact may be necessary in association with this project component. A nearshore berm site, away from potential hardground impact, has also been identified for use as an alternative maintenance dredged material disposal site. Extension of Federal participation from 10 years from completion of construction to 50 years from the start of construction is also recommended.

Lake Worth Inlet to South Lake Worth Inlet Project Segment:

187. Recommend that the project for Palm Beach County, Florida for Lake Worth Inlet to South Lake Worth Inlet (Palm Beach Island) authorized in 1958 (PL 85-500) be deauthorized. The following project components for Palm Beach Island would be added as project modifications to the Palm Beach County, Florida (1962) project. Extension of Federal participation from 10 years from the completion of construction to 50 years from the start of construction is also recommended for each project component.

188. Lake Worth Inlet. The recommended plan for Lake Worth Inlet requires the construction of a new fixed sand transfer plant to be located north of the inlet with three discharge points located along the dry beach 750, 1,250 and 1,750 feet south of the south jetty on Palm Beach Island. This system would be designed for a target bypassing rate of about 160,000 cubic yards per year to the south, across the inlet, through a 12-in pipeline.

189. The recommended plan for the sand bypassing plant would include:

a. A deposition area north of the north jetty,

b. An array of jet pumps suspended from a pier oriented perpendicular to the shoreline, or a single jet pump deployed by a crane from the north jetty,

c. A clear water pump and pipeline providing water to the jet pumps,

d. An on shore pumphouse containing the clear water pump and a booster pump for transferring the dredged material past the inlet,

e. A slurry pit to ensure the proper ratio of solids to water,

f. An drilled tunneled pipeline under the inlet from north of the north jetty to the south side of the south jetty, and

g. All associated pipe, valves, instruments, and controls required for operation of the system, including three remote controlled discharge valves located within the first 2,250 feet south of the south jetty.

190. The detailed sand transfer plant design would be determined within a Feature Design Memorandum (FDM) to be prepared during PED.

191. North-end Palm Beach Island. The 1.95 mile beach restoration and periodic nourishment project component located between DEP monuments R-76 and R-85 is authorized (1958), but not constructed. The optimal berm width is 10 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 100,000 cubic yards with a 190 foot toe of fill. The recommended renourishment interval is 4 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 281 feet with a total volume of 239,400 cubic yards. Mitigation for approximately 18 acres of hardground impact may be necessary in association with this project segment. Nearshore berms are not feasible in association with this project component due to the presence of nearshore hardgrounds.

192. <u>Palm Beach Island (Mid-town).</u> The 3.1 mile beach restoration and periodic nourishment project component located between DEP monuments R-91 and R-105 is authorized (1958), but not constructed. The optimal berm width is 25 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 568,400 cubic yards with a 390 foot toe of fill. The recommended renourishment interval is 4 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment is 455 feet with a total volume of 1,025,7800 cubic yards. Mitigation for approximately 3.65 acres of hardground impact may be necessary in association with this project component. Three potential nearshore berm sites have been identified for use as an alternative maintenance dredged material disposal site for the Federal navigation project at Palm Beach Harbor.

193. <u>South-end Palm Beach Island.</u> This 3.25 mile beach restoration and periodic nourishment project component located between DEP monuments R-116 and R-132 is authorized (1958), but not constructed. The optimal berm width is 35 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 248,900 cubic yards with a 350 foot toe of fill. The recommended renourishment interval is 4 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 432 feet with a total volume of 674,500 cubic yards. Mitigation for approximately 5.4 acres of hardground may be necessary in association with this project component.

<u>South Lake Worth Inlet to Boca Raton Inlet Segment</u>:

194. <u>South Lake Worth Inlet</u>. The recommended plan for South Lake Worth Inlet requires the construction, operation and maintenance of a new sand transfer plant to be located north of the inlet with one discharge point located approximately 2,000 feet south of the south jetty. This system would be designed for a target bypassing rate of about 120,000 cubic yards per year. The design would be similar to the Lake Worth Inlet sand transfer plant and would similarly be determined within a Feature Design Memorandum (FDM) during PED studies.

195. <u>Ocean Ridge.</u> The 1.35 mile beach restoration and periodic nourishment project component located between DEP monuments R-152 and R-159 is authorized (1962), but not constructed. This project is scheduled for construction by Palm Beach County during 1996. The optimal berm width is 60 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 770,000 cubic yards and includes 8 years of advance nourishment. The annual advance nourishment is 62,600 cubic yards. Two nearshore berm sites, however, have been recommended as potential dredged material disposal sites. Extension of federal participation from 10 years from completion of construction to 50 years from the start of construction is recommended.

196. Delray Beach. The recommended 2.7 mile beach restoration and periodic nourishment project component located between DEP monuments R-175 and R-188 is authorized and constructed. This project is recommended for modification with an additional 20 feet optimal berm width at elevation +9.0 feet NGVD and slopes of 1:20 berm to MLW and 1:30 from MLW to existing bottom. The recommended additional design volume is 155,300 cubic yards with a 290 foot equilibrium toe of fill. No hardgrounds exist in the vicinity of this project so no mitigation will be required. Although this project component is a considerable distance from either inlet, an extensive nearshore berm site offshore of this project component is recommended as a potential dredged material disposal site. The Delray project has been extended to 50 years of Federal participation by Assistant Secretary of Army (Civil Works) under Section 934.

197. Highland Beach. The 3.4 mile beach restoration and periodic nourishment project component located between DEP monuments R-188 and R-205 is a modification to the authorized (1962) periodic nourishment project. It would fill in a gap between two authorized projects for lessening end losses. The optimal berm width of this project component is 120 feet at elevation +9.0 feet NGVD, and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 1,017,450 cubic yards with a 350 foot toe of fill. The recommended renourishment interval is 7 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 450 feet with a total volume of 1,900,430 cubic yards. Mitigation for approximately 1.9 acres of hardground may be necessary for this project component. One nearshore berm site has been identified offshore of this project coastline. Extension of Federal participation from 10 years from completion of construction to 50 years from the start of construction is recommended.

198. Boca Raton. The 1.65 mile beach restoration and periodic nourishment project component located between DEP monuments R-205 and R-213 is authorized and constructed. Extension of Federal participation from 10 years from completion of construction to 50 years from the start of construction is recommended. Another recommended modification to this project component is a nearshore berm site as an alternative maintenance dredged material disposal site.

<u>Other Palm Beach County Project Segment Alternatives</u>:

199. As previously discussed, specific recommendations for the 1.9 miles of northern the Palm Beach County shoreline, north of Jupiter Inlet, will be addressed in the Region IV COFS study. In addition to the above specific project components, periodic nourishment as necessary and justified is an existing project feature for Palm Beach County, Florida. No modification of this project feature is recommended for the economic life of the project. Dune grassing, as necessary and justified is also recommended for the Palm Beach County shoreline as a cost effective project feature.

BROWARD COUNTY:

<u>Boca Raton Inlet (Palm Beach County) to Hillsboro Inlet (Broward County) Segment</u>:

200. <u>Deerfield Beach/Hillsboro Beach (Segment I)</u>. The 4.4 mile beach restoration and periodic nourishment project segment located between DEP monuments R-1 and R-24 is authorized, but not constructed. The optimal berm width is 30 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 746,700 cubic yards with a 300 ft toe of fill. The recommended renourishment interval is 7 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 406 feet with a total volume of 1,055,820 cubic yards. Mitigation for approximately 4.65 acres of hardground may be necessary in association with this project segment. A nearshore berm dredged material disposal site has been identified and recommended offshore this project shoreline. It is also recommended that Federal participation in this project segment be extended from 10 years from completion of construction to 50 years from the start of construction.

201. <u>Hillsboro Inlet</u>. Navigation improvements are being considered for the outer channel at this inlet to provide additional advanced maintenance for the entrance channel as part of the Hillsboro Inlet, Florida, Federal navigation project. Two alternatives are being evaluated. One alternative is as designed and contained within a permit request by the sponsor. The other is an alternative designed by Jacksonville District. The recommendations for this navigation project will be addressed in a separate navigation report which will address related potential impacts to the adjacent shorelines.

Hillsboro Inlet to Port Everglades Inlet Segment (Segment II):

202. Pompano/Lauderdale-By-The-Sea. The 5.2 mile beach restoration and periodic nourishment project component located between DEP monuments R-24 and R-53 is authorized and constructed. This project is recommended for modification with an additional 35 feet optimal berm width at elevation +9.0 feet NGVD and slopes of 1:20 berm to MLW and 1:30 from MLW to existing bottom. The recommended additional design volume is 600,000 cubic yards with a resulting equilibrium toe of fill of 365 feet. Mitigation for approximately 12.25 acres of hardground may be necessary in association with this project segment modification. A nearshore berm dredged material disposal site has been identified and recommended off this project shoreline. Extension of Federal participation in this project segment from 10 years from completion of construction to 50 years from the start of construction is also recommended.

203. Fort Lauderdale. This 4.0 mile project segment area located between DEP monuments R-53 to R-74 is authorized for periodic nourishment. A beach restoration and periodic nourishment project component modification is recommended. The recommended optimal berm width is 25 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 466,700 cubic yards. The recommended renourishment interval is 6 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 500 ft with a total volume of 858,193 cubic yards. Federal participation to 50 years from the start of construction of this component is recommended. Mitigation for approximately 18 acres of hardground impact may be necessary in association with this project component. Nearshore berms are not feasible in association with this project component due to the presence of nearshore hardgrounds.

Port Everglades Inlet (Broward County) to Bakers Haulover Inlet (Dade County):

Broward County (Segment III):

204. Segment III of the Broward County project includes two authorized beach restoration and periodic nourishment project sections, J. U. Lloyd and Hollywood/Hallandale. Extension of Federal participation to the 50 year economic life of these projects was approved by Assistant Secretary of Army (Civil Works) under Section 934 in September 1992.

205. J.U. Lloyd. The 2.3 mile beach restoration and periodic nourishment project component located between DEP monuments R-86 and R-98 is authorized and constructed. The optimal berm width in the re-analysis of this project remains at 100 feet at elevation +10 feet NGVD and slopes of 1:15 berm to MLW and 1:30 from MLW to existing bottom. The design volume, including initial fill and advance nourishment is 1,032,000 cubic yards. The renourishment interval is 6 years. The only recommended modification to this project segment is a nearshore berm site as an alternative maintenance dredged material disposal site.

206. Hollywood/Hallandale. The 5.25 mile beach fill project located between DEP monuments R-101 and R-128 is authorized and constructed. This project is recommended for modification with an additional 50 feet optimal berm width at elevation +7.0 feet NGVD and slopes of 1:15 berm to MLW and 1:40 from MLW to existing bottom. The recommended additional design volume is 720,000 cubic yards resulting in a project equilibrium toe of fill of 230 feet. The renourishment interval is 6 years. No hardgrounds exist in the immediate vicinity of this project so no mitigation will be required. A nearshore berm dredged material disposal site has been identified offshore of this project segment.

207. Dania. This 0.6 mile reach of beach is presently authorized for periodic nourishment. A modification to a beach restoration and periodic nourishment project is recommended for this project segment component located between DEP monuments R-98 and R-101. Initial restoration of the beach at Dania would fill in the gap between J.U. Lloyd and Hollywood/Hallandale. Due to the small project length, the fill would be designed as a transition between these two all ready constructed projects and help reduce end losses in Segment III.

208. The optimal berm width transition between J. U. Lloyd and Hollywood/ Hallandale is 125 feet, on the average (i.e., between 100 and 150 feet), with a transition berm height between elevation +10.0 feet and +7.0 NGVD and slopes of 1:15 berm to MLW and 1:40 from MLW to existing bottom. The initial design volume is 208,300 cubic yards. The recommended renourishment interval is 6 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 220 feet with a total volume of 460,840 cubic yards. Federal participation in the economic life of this transition project component is recommended.

Other Broward County Project Segment Alternatives:

209. In addition to the above specific project segments, periodic nourishment as necessary and justified is an existing project feature to the Broward County, Florida project. No change in this project feature is recommended at this time. Dune grassing, as necessary and justified is also recommended for the Broward County shoreline as a cost effective project feature.

DADE COUNTY:

Continuation of Port Everglades Inlet (Broward County) to Bakers Haulover Inlet (Dade County):

210. Golden Beach. It is recommended that the Dade County, Florida, Beach Erosion Control and Hurricane Protection Project be modified to include initial restoration and periodic nourishment for the 1.2 mile shoreline located between DEP monuments R-1 and R-7 in Dade County. This project component would fill in a gap between the Dade County and Broward County authorized projects, decreasing project end losses. The optimal berm width in the analysis of this project is 100 feet at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 311,000 cubic yards with a 260 foot toe of fill. The recommended renourishment interval is 6 years. The distance to the recommended equilibrium toe of fill, including initial fill plus advance nourishment is 832 feet with a total volume of 534,660 cubic yards. Mitigation for approximately 5.25 acres of hardground impact may be necessary in association with this project segment. One nearshore berm site has been identified as an alternative maintenance dredged material disposal site.

211. Sunny Isles. The 2.65 mile beach fill project segment component located between DEP monuments R-7 and R-20 is authorized and constructed. This segment of the Dade County, Florida project is recommended for modification with an additional 20 feet optimal berm width at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The recommended additional design volume is 146,700 cubic yards with an additional 200 foot toe of fill extension. No hardgrounds exist in the vicinity of this project so no mitigation will be required. One nearshore berm site has been identified as an alternative maintenance dredged material disposal site.

Bakers Haulover Inlet to Government Cut:

212. Bal Harbour, Surfside, Miami Beach. The 9.3 mile beach fill project segment located between DEP monuments R-27 and R-74 is authorized and constructed. The only recommended modifications to this project segment are the addition of four nearshore berm sites that have been identified as an alternative maintenance dredged material disposal sites.

213. Government Cut. As identified in a previous DM, a sand tightening of Government Cut has been recommended. This sand tightening will help reduce end losses to the southern portion of the Miami Beach project segment and further reduce Government Cut maintenance dredging requirements. The sand tightening project will be undertaken as a separate project modification.

Project Segments South of Government Cut:

214. Virginia Key/Northern Key Biscayne. Shore protection of Virginia Key and northern Key Biscayne was authorized by the River and Harbor Act of 1962 (PL 87-874). Construction of the 1.8 mile Virginia Key shoreline and 1.9 mile northern Key Biscayne shoreline was completed in 1969. The Virginia Key shoreline was renourished in 1972 and 13 groins were also constructed. This project was deauthorized in 1990. As documented in the 1992 Rehabilitation Report following Hurricane Andrew, in August 1992, the Virginia Key project was found to be performing well to date. No project segment modification is recommended for Virginia Key at this time.

215. Key Biscayne. The 2.3 mile beach fill project located between DEP monuments R-101 and R-113 was initially constructed in 1985 under the authority of Section 103 of the 1962 River and Harbor Act. Nourishment for 50 years was authorized, however, the Federal limit of $1,000,000 under Section 103 has been met. It is recommended that the Dade County project be modified to incorporate this project segment so that Federal participation in periodic nourishment can be continued through the economic life of this project segment. An additional optimal berm width of 10 feet at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom is recommended. The additional project design volume is 106,660 cubic yards. The recommended renourishment interval is 7 years.

Other Dade County Project Segment Alternatives:

216. In addition to the above specific project segment modifications, periodic nourishment as necessary and justified is recommended for all Atlantic Ocean shorelines within Dade County for the economic life of each project segment. Dune grassing, as necessary and justified is also recommended for the Dade County shoreline as a cost effective project feature.

PROJECT COSTS

217. Project costs have been developed for the beach fill alternatives based upon May 1995 unit price levels and the use of borrow areas offshore. Given the dwindling supply of sand available from inlets and offshore borrow areas in Region III, unit prices have also been developed for aragonite (calcium carbonate) and upland sources and have been used for economic analysis in this report.

218. Unit prices for beach fills are based on the use of hopper and pipeline dredging. Basic mobilization costs of $300,000 to $420,000 and an additional $100,000 for mobilizing to another project segment were used.

219. Costs were generated for each beach fill segment based on a long-term average annual erosion rate and an overfill factor between 6 and 15 percent. Because of the high cost of mobilizing equipment to the various beach fill projects, the option of combining nourishment of some projects were considered. Cost estimates included mobilization and demobilization, unit prices of fill, monitoring, and environmental considerations.

220. The analysis was performed over a 50-year period to determine the annual cost of the authorized beach fill for each project, using a 7.625 percent interest rate. The beach fill alternatives evaluated in the plan formulation included 20, 40, 60, 80, and 100-ft. equivalent extensions (in some cases 120 and 140-ft. extensions). Costs were developed for each extension. An example is shown in Table 14.

221. MCACES cost estimates including mitigation costs are located in Appendix D.

222. Advanced Nourishment Requirements. The majority of beach fill projects include nourishment to maintain the dimensions of the beach fill that were selected for construction. These beach dimensions and the resulting project performance are factored into the economic analysis of the project. In order to ensure that these design dimensions are maintained until the first periodic nourishment event occurs, advanced nourishment of the beach fill is usually incorporated during the initial beach fill operation. Advanced nourishment usually consists of placing an additional amount of beach fill to offset the expected losses from the time of completion of the project to the first scheduled nourishment event. Table 14 is an example of one of the cost optimization analyses which provide the nourishment interval. Enough advanced nourishment will be placed to ensure that the design fill will be maintained for that time interval. Advanced nourishment volumes are included in the initial fill volume. Each project segment's cost optimization is on file at the Jacksonville District.

TABLE 14

SAMPLE
COST OPTIMIZATION
COST OF FLORIDA - REGION III

AVERAGE ANNUAL COST OPTIMIZATION OF BEACH RENOURISHMENT INTERVAL - 100-ft Project
PROJECT NAME : HIGHLAND
APRIL 1994 PRICE LEVELS

ECONOMIC ANALYSIS PERIOD =	50 YEARS	MOBILIZATION COST	=	$720,000.00		MONTHLY PRODUCTION RATE :
INTEREST RATE	7.750 PERCENT	OTHER FIXED COSTS	=	$100,000.00		200,000 CUBIC YARDS
ANNUAL EROSION RATE	119,000 CUBIC YARDS	PRICE PER CUBIC YARD	=	$2.80		
FILL BEHIND ECL =	0 CUBIC YARDS	BIO/TURB MONITORING	=	$23,000	PER MONTH	CAPITAL RECOVERY FACTOR :
DESIGN FILL QUANTITY =	1,017,450 CUBIC YARDS	CONTINGENCY	=	25.00%		0.079400
RENOURISHMENT FACTOR Rf =	6.00%	E&D, S&A	=	15.00%		

TOTAL DESIGN FILL + ECL (C.Y.)	NOURISHMENT INTERVAL (YEARS)	ADVANCE NOURISHMENT W/ Rf OVERFILL (C.Y.)	TOTAL INITIAL FILL (C.Y., WITH Rf OVERFILL)	EST. CONST. TIME (MO'S)	INITIAL COST	INTEREST AND AMMORT-IZATION	RENOURISHMENT QUANTITY, WITH Rf OVERFILL (C.Y.)	RENOUR-ISHMENT COST	ANNUAL COST OF RENOUR-ISHMENT	TOTAL AVERAGE ANNUAL EQIV. COST
1,017,450	1	126,140	1,143,590	5.7	$5,970,749	$474,078	126,140	$1,707,316	$1,707,316	$2,181,394
1,017,450	2	252,280	1,269,730	6.3	$6,499,315	$516,046	252,280	$2,235,882	$1,076,237	$1,592,282
1,017,450	3	378,420	1,395,870	7.0	$7,027,882	$558,014	378,420	$2,764,448	$853,618	$1,411,632
1,017,450	4	504,560	1,522,010	7.6	$7,556,448	$599,982	504,560	$3,293,014	$733,494	$1,333,476
1,017,450	5	630,700	1,648,150	8.2	$8,085,014	$641,950	630,700	$3,821,580	$654,669	$1,296,619
1,017,450	6	756,840	1,774,290	8.9	$8,613,580	$683,918	756,840	$4,350,146	$596,742	$1,280,660
1,017,450	7	882,980	1,900,430	9.5	$9,142,146	$725,886	882,980	$4,878,712	$550,969	$1,276,855
1,017,450	8	1,009,120	2,026,570	10.1	$9,670,712	$767,855	1,009,120	$5,407,278	$512,974	$1,280,829
1,017,450	9	1,135,260	2,152,710	10.8	$10,199,278	$809,823	1,135,260	$5,935,844	$480,325	$1,290,148
1,017,450	10	1,261,400	2,278,850	11.4	$10,727,844	$851,791	1,261,400	$6,464,410	$451,561	$1,303,351
1,017,450	11	1,387,540	2,404,990	12.0	$11,256,410	$893,759	1,387,540	$6,992,976	$425,747	$1,319,506
1,017,450	12	1,513,680	2,531,130	12.7	$11,784,976	$935,727	1,513,680	$7,521,542	$402,262	$1,337,989
1,017,450	13	1,639,820	2,657,270	13.3	$12,313,542	$977,695	1,639,820	$8,050,108	$380,670	$1,358,365
1,017,450	14	1,765,960	2,783,410	13.9	$12,842,108	$1,019,663	1,765,960	$8,578,674	$360,659	$1,380,322
1,017,450	15	1,892,100	2,909,550	14.5	$13,370,674	$1,061,631	1,892,100	$9,107,240	$341,997	$1,403,629
1,017,450	16	2,018,240	3,035,690	15.2	$13,899,240	$1,103,600	2,018,240	$9,635,806	$324,511	$1,428,110
1,017,450	17	2,144,380	3,161,830	15.8	$14,427,806	$1,145,568	2,144,380	$10,164,372	$308,062	$1,453,630
1,017,450	18	2,270,520	3,287,970	16.4	$14,956,372	$1,187,536	2,270,520	$10,692,938	$292,543	$1,480,079
1,017,450	19	2,396,660	3,414,110	17.1	$15,484,938	$1,229,504	2,396,660	$11,221,504	$277,867	$1,507,371
1,017,450	20	2,522,800	3,540,250	17.7	$16,013,504	$1,271,472	2,522,800	$11,750,070	$263,962	$1,535,434

OPTIMUM NOURISHMENT INTERVAL

Primary Project Benefits

223. Preliminary economic justification for project formulatioin of the beach fill projects in Region III are based solely on the protection of structural improvements located along the front row of development along the project shoreline. Shorefront development is a mix of single family, multi-family, commercial, and park development. The economic evaluation determines the justification of Federal participation based on the benefits generated versus the cost of providing shore protection and storm damage reduction along the project shorefront.

224. Benefits resulting from the project construction are categorized as primary and incidental. Primary benefits, the only benefits used for project formulation, are realized through the prevention and/or reduction of storm damages to coastal development. Tables 16 through 18 summarize the preliminary economic justifications for project formulation.

225. Guidance for the inclusion of incidental project benefits such as recreation are set forth in Engineering Regulation (ER) 1105-2-100 which states "recreation benefits produced as a benefit of the basic project may exceed 50 percent of the total project benefits, but economic justification must be demonstrated on the basis of recreation benefits limited to 50 percent of total project benefits."

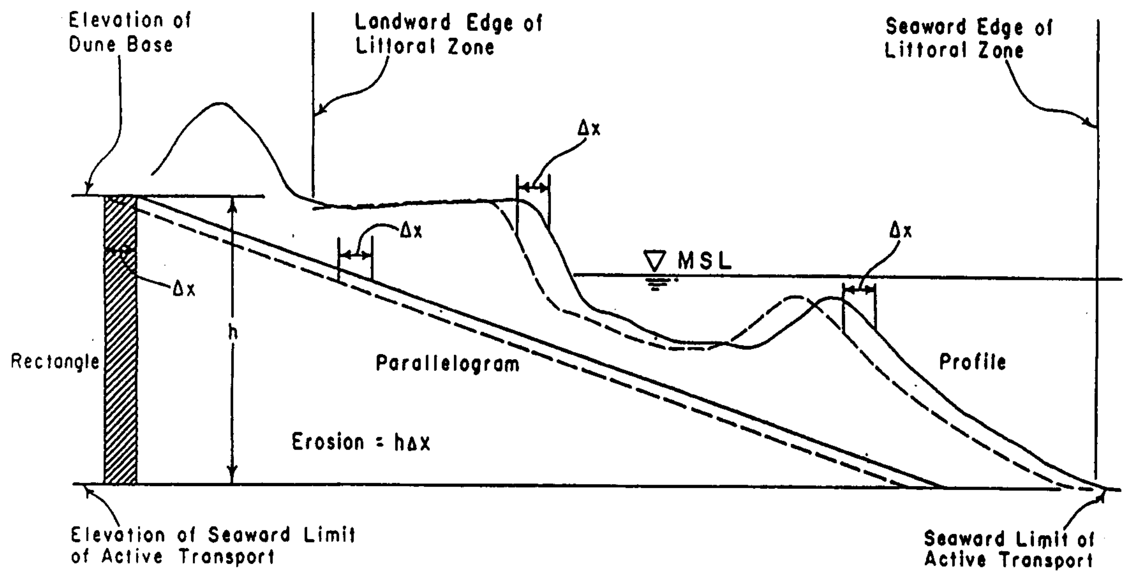
226. In the evaluation of the projects, benefits stemming from the elimination of existing erosion control structures and storm damage to development were based on May 1995 price levels and an interest rate of 7.625 percent.

227. In the analysis of the storm damage benefits which the authorized beach fills will provide, the damages projected for the 50-years following completion of construction for each project were determined (assuming with and without project conditions). Damages were simulated from changes due to both long-term average annual shoreline recession and storms. A probabilistic frequency vs. storm recession distance curve was developed for each county and is discussed in greater detail in Appendix D. Annual shoreline position changes were based on historical shoreline recession (or accretion) rates for the study area.

228. The extent of damages are generated as a result of annual shoreline position change and the damage probabilities from the frequency vs. recession distance curve. Damages are claimed as the result of these two mechanisms in the Storm Damage Model (SDM), a computer program developed at USAED Jacksonville. The model computes damages for each foot of storm recession distance. These computations are performed for each lot and then summarized as backfill damage, structural damage, and armor damage. Structural damage or "Upland" damages include damage to existing structural improvements such as single family homes or condominiums. Upland damages could also include pools, utilities, roads, tennis courts, parking lots, and patios. The extent of damages to existing development is a function of the protection afforded by existing widths of beach and dunes. As a result of future erosion, damages to development in the future will tend to be more severe with a given storm due to the fact that the amount of beach protection between a structure and the shoreline will decrease with time. After the relationships between recession and damage are determined, relationships between probability and damage are then determined by assigning probabilities from the appropriate frequency-recession relationship. This computational process results in without and with project frequency-damage curves for the existing condition and each future year analyzed. The frequency-damage relationships are integrated to produce average annual damages. Basic assumptions of this computer model are that a structure experiences damage when the probabilities landward extent of the erosion envelope reaches the front of the structure. Full value of the bottom two floors of the structure is realized when the erosion reaches the middle of the structure. Inherent in the routine are the capabilities of coastal structures to halt erosion, and ability to construct new coastal structures upon the failure of the existing structures. A more detailed discussion of the SDM and the required input data is provided in Appendix F.

229. The SDM was used to compute damages due to both shoreline recession and storm activity for with and without project conditions. The concept used to determine with project conditions, equilibrium profile theory, is illustrated in Figure 23. If an eroding shoreline is assumed to maintain the same profile above the seaward limit of significant sediment transport (limiting depth) while it erodes, the volume of material eroded per foot of beach is equivalent to the vertical distance from the beach berm crest to the limiting depth, multiplied by the horizontal retreat of the beach profile, $\triangle x$. The volume of material eroded may be represented by a rectangle with a vertical height equivalent to the berm elevation plus the limiting depth and a width equivalent to the assumed uniform horizontal retreat, as shown in Figure 23. Likewise, a volume of material placed on the beach may be represented by a rectangle with a vertical height equivalent to the berm elevation plus the limiting depth and a width equivalent to the assumed uniform horizontal extension, $\triangle x$, provided by the beach fill. The equivalent profile extensions ($\triangle x$)

Figure 23
COAST OF FLORIDA STUDY - REGION III



Erosion within littoral zone during uniform retreat of an idealized profile.

provided by various beach fill design cross-sections were input to the SDM ($) model for with-project conditions.

230. The shoreline equilibrium profile extensions (from 20 to a maximum of 140-foot extensions were examined) are simulated by SDM, and the reduction in damages identified for the with project condition. Storm damage reduction (which includes the effects of long term equilibrium profile recession) is the difference between the expected annual damages under the without-project conditions minus the expected annual damages under the with-project conditions. Damages for the 50-year economic life of the project were determined (assuming with and without project conditions).

231. In determining the design cross-sections which generated the greatest net storm damage prevention benefits, the first step was to examine various fixed increments of berm (equivalent shoreline) extension. The equivalent shoreline extension providing the greatest net annual storm damage reduction benefit was chosen for more detailed examination. Location of hardgrounds were carefully assessed in an attempt to limit environmental impacts in the development of implementable project segments. The recommended plan was developed by adjusting berm width and/or the renourishment interval (advance nourishment) to reduce environmental impacts. Renourishment intervals were adjusted to optimize mobilization and demobilization costs of nearby adjacent separable project segments. The recommended NED plan was selected based on maximizing net average annual storm damage reduction benefits, modified to be environmentally sensitive and implementable plan by reducing environmental impacts to adjacent hardgrounds (see Figures 9 - 22). To determine design berm widths given in the final recommended plans, the volume from the equivalent equilibrium profile extension (Δx), was converted to the beach fill design sections by fitting the volume to the existing beach profiles. Project segments for North-end Palm Beach Island, Highland Beach, Deerfield/Hillsboro Beach, Pompano/Lauderdale-by-the-Sea, and Fort Lauderdale were adjusted to avoid hardbottom impacts.

232. Primary benefits for dune grassing, and nearshore berm placement are cost savings due to the reduction of beach fill volume necessary for advance nourishment. Construction of a STP at Lake Worth Inlet would result in cost savings to the O&M of the Federal navigation project at Lake Worth Inlet. These alternatives are discussed in the "Cost Savings" section.

Incidental Benefits

233. Recreation Benefits. The estimated recreational benefits attributable to the proposed beach protection projects contained in this report were determined using procedures based on those prescribed in the Manual of Procedures developed by the Water Resources Council and published in the December 1979 Federal Register (Volume 44, 242/Friday, December 1979). Due to the existence of built and authorized projects which are found throughout the three county study area, the following analysis consists of two components. The first component is an estimation of recreation benefits associated with existing project conditions. The second component estimates the recreation benefits attributable to the projects recommended in this report.

234. Recreation benefits accrue from the preservation of, or the increase in, the use of shore front recreational facilities for beach activities which would be expected if beach conditions are improved. The methodology used in estimating recreation benefits entails determining the total beach visits to each of the counties in the Coast of Florida Region III Market Area under two different conditions for each of the two aforementioned components. The difference of the results of the two analyses establishes beach visitation attributable to the considered work. Recreation benefits attributable to the considered works were determined by applying a value to the visits attributable to the new beach. The value of a beach visit was based on the results of analysis which utilized travel cost methodology. No recreational benefits are claimed on privately owned land as this would duplicate land loss prevention benefits to privately owned property.

235. The analysis centers on the comparison of total beach visits to the Coast of Florida Region III Market Area under two different conditions for both components. The first component, which estimates benefits attributable to existing conditions, involves comparing Pre-project conditions with Existing conditions. Pre-project conditions are defined as the beach condition prior to the implementation or authorization of a project. Existing conditions are defined as the current beach condition including projects currently in place or authorized for construction prior to the year 2000. Existing conditions are actually the "without project" condition.

236. The second component, which estimates recreation benefits associated with recommended projects compares With and Without project conditions. The With Project condition is the beach condition associated with the implementation of the recommended projects. The Without Project condition, as previously mentioned, is synonymous with the existing condition; it is the current beach condition with the addition of any authorized but currently unconstructed projects expected to be built by the year 2000.

237. Summary of the results and further detail on the recreational analysis are found in Appendix F.

Incremental Benefit Analysis

238. Incremental benefit analysis of the berm width adjustments to the existing authorized projects is found in Appendix F. Table 15 summarizes the justification of the existing authorized projects. Total average annual equivalent costs are compared with the benefits associated with the project for each alternative.

Preliminary Economic Justification

239. Tables 16 through 18 summarize the economic justification for the proposed beach fill and sand transfer plant (STP) projects by county. Annual costs and benefits for the directed 7.625 percent interest rate are displayed. O&M costs for the beach fill projects are approximately $40,000 per year. As was done in the incremental analysis, the total average annual equivalent costs are compared with the benefits associated with the project for each beach fill and STP alternative.

Cost Savings

240. Two methodologies were analyzed to increase cost savings for the NED beach fill projects: dune grassing, and the placement of nearshore berms. The additional volumes of beach quality sand onshore from the grassing and nearshore berms were deducted from advance nourishment for the projects. The cost savings from the reduction in advance nourishment was compared to the cost to implement the methodologies. Cost savings were realized by reducing the amount of required maintenance dredged material at Lake Worth Inlet by the construction of a new sand transfer plant (STP), and by reducing the O&M costs associated with the old plant in comparison to the O&M costs of the new plant.

241. Dune Grassing. A reduction in periodic nourishment costs can be realized by planting beach grass and sea oats on the beach berm. Every COFS beach fill project has a potential benefit from dune grassing due to the prevention of wind blown sand losses and stabilization of the berm. Following 1986 renourishment of the Duval County Shore Protection Project, about 36,000 cubic yards of sand had accumulated above the design profile between 1986 and 1989

TABLE 15

CONSTRUCTED (EXISTING) SHORE PROTECTION PROJECTS ECONOMIC ANALYSIS SUMMARY

Location	Upland Damage	Coastal Armor Damage	Backfill Damage	Prevention of Private Land Loss	Total Average Annual Benefits w/Project	Total Average Annual Costs	Net Annual Benefits	Benefit to Cost Ratio
PALM BEACH COUNTY								
Jupiter/Carlin (R-13 to R-19)								
w/o Project	$811,800	$11,600	$4,100	$128,900	$956,400	$658,500	$297,900	1.5
w/80' Project	$0	$0	$0	$0				
Ocean Ridge (R-152 to R-159)								
w/o Project	$381,700	$23,300	$5,000	$237,300	$647,300	$586,700	$60,600	1.1
w/60' Project	$0	$0	$0	$0				
Delray Beach (R-175 to R-188)								
w/o Project	$2,548,600	$97,600	$14,200	$231,400	$2,828,000	$569,000	$2,259,000	5.0
w/80' Project	$60,000	$3,400	$400	$0				
Boca Raton (R-205 to R-213)								
w/o Project	$278,700	$6,800	$1,300	$135,400	$422,200	$666,800	($244,600)	0.63
w/100' Project	$0	$0	$0	$0				
BROWARD COUNTY								
Pompano (R-26 to R-53)								
w/o Project	$25,029,100	$523,000	$70,300	$1,490,100	$25,712,500	$935,100	$24,777,400	27.5
w/60' Project	$1,400,000	$0	$0	$0				
J.U. Lloyd (R-86 to R-98) and Hollywood/Hallandale (R-101 to R-128)								
w/o Project	$6,599,500	$188,300	$34,500	$506,900	$6,483,600	$928,700	$5,554,900	7.0
w/100' Project	$840,700	$4,400	$500	$0				
DADE COUNTY								
Sunny Isles (R-7 to R-20)								
w/o Project	$3,676,000	$325,000	$29,600	$479,300	$4,302,200	$763,400	$3,538,800	5.6
w/60' Project	$189,300	$16,600	$1,800	$0				
Bal Harbour/Surfside/Miami Beach								
w/o Project	$36,339,300	$3,836,400	$464,400	$1,704,200	$41,930,400	$4,193,800	$37,736,600	10.0
w/100' Project	$413,900	$0	$0	$0				
Key Biscayne (R-96 to R-113)								
w/o Project	$1,875,500	$415,300	$92,000	$143,800	$2,494,400	$900,000	$1,594,400	2.8
w/60' Project	$27,300	$4,000	$900	$0				

TABLE 16

PALM BEACH COUNTY ALTERNATIVE PROJECTS ECONOMIC ANALYSIS SUMMARY

Location	Upland Damage	Coastal Armor Damage	Backfill Damage	Prevention of Private Land Loss	Total Average Annual Benefits w/Project	Total Average Annual Costs	Net Annual Benefits	Benefit to Cost Ratio
Jupiter/Carlin (R-13 to R-19)			Period of Analysis 50 Years (2000-2050)					
w/o Project	$811,800	$11,600	$4,100	$128,900				
w/20' Project	$0	$0	$0	$0				
w/40' Project	$0	$0	$0	$0				
w/60' Project	$0	$0	$0	$0	From Table 15)			
w/80' Project	$0	$0	$0	$0	$956,400	$658,500	$297,900	1.5
w/100' Project	$0	$0	$0	$0				
Juno/Ocean Cay (R-27 to R-41)			Period of Analysis 50 Years (2000-2050)					
w/o Project	$4,061,800	$15,200	$2,000	$319,700				
w/20' Project	$479,800	$0	$0	$0	$3,918,900	$268,200	$3,650,700	14.6
w/40' Project	$87,200	$0	$0	$0	$4,311,500	$323,400	$3,988,100	13.3
w/60' Project	$13,800	$0	$0	$0	$4,384,900	$378,600	$4,006,300	11.6
w/80' Project	$700	$0	$0	$0	$4,398,000	$433,800	$3,964,200	10.1
w/100' Project	$0	$0	$0	$0	$4,398,700	$489,000	$3,909,700	9.0
Lake Worth Inlet STP (R-75 to R-78)			Period of Analysis 50 Years (2001-2050)					
w/o Project	$83,500	$600	$100	$205,700				
w/Project	$0	$0	$0	$0	$769,100	$585,700	$183,400	1.3
				(Includes $204,200 Maintenance Dredging Cost Savings)				
				(Includes $275,000 annually for STP O&M savings)				
N. Palm Beach Island (R-76 to R-85)			Period of Analysis 50 Years (1998-2048)					
w/o Project	$708,900	$37,500	$9,600	$369,100				
w/20' Project	$0	$0	$0	$0	$1,125,100	$519,700	$605,400	2.2
w/40' Project	$0	$0	$0	$0	$1,125,100	$553,600	$571,500	2.0
w/60' Project	$0	$0	$0	$0	$1,125,100	$587,400	$537,700	1.9
w/80' Project	$0	$0	$0	$0	$1,125,100	$621,300	$503,800	1.8
w/100' Project	$0	$0	$0	$0	$1,125,100	$655,100	$470,000	1.7
Palm Beach Island (R-91 to R-105)			Period of Analysis 50 Years (1989-2039)					
w/o Project	$4,580,600	$400,100	$103,100	$413,200				
w/20' Project	$901,300	$39,400	$7,800	$0	$4,548,500	$751,000	$3,797,500	6.1
w/40' Project	$296,300	$4,400	$600	$0	$5,195,700	$825,000	$4,370,700	6.3
w/60' Project	$65,500	$0	$0	$0	$5,431,500	$898,600	$4,532,900	6.0
w/80' Project	$6,100	$0	$0	$0	$5,490,900	$972,300	$4,518,600	5.6
w/100' Project	$400	$0	$0	$0	$5,496,600	$1,046,000	$4,450,600	5.3
w/120' Project	$0	$0	$0	$0	$5,497,000	$1,119,700	$4,377,300	4.9
S. Palm Beach Island (R-116 to R-132)			Period of Analysis 50 Years (1998-2048)					
w/o Project	$2,753,900	$5,800	$2,800	$602,200				
w/20' Project	$0	$0	$0	$0	$3,364,700	$1,039,000	$2,325,700	3.2
w/40' Project	$0	$0	$0	$0	$3,364,700	$1,154,500	$2,210,200	2.9
w/60' Project	$0	$0	$0	$0	$3,364,700	$1,270,000	$2,094,700	2.6
w/80' Project	$0	$0	$0	$0	$3,364,700	$1,385,400	$1,979,300	2.4
w/100' Project	$0	$0	$0	$0	$3,364,700	$1,500,900	$1,863,800	2.2

TABLE 16
(Continued)
PALM BEACH COUNTY ALTERNATIVE PROJECTS
ECONOMIC ANALYSIS SUMMARY

Location	Upland Damage	Coastal Armor Damage	Backfill Damage	Prevention of Private Land Loss	Total Average Annual Benefits w/Project	Total Average Annual Costs	Net Annual Benefits	Benefit to Cost Ratio
Ocean Ridge (R-152 to R-159)			Period of Analysis 50 Years (1989-2039)					
w/o Project	$381,700	$23,300	$5,000	$237,300				
w/20' Project	$0	$0	$0	$0				
w/40' Project	$0	$0	$0	$0	From Table 15)			
w/60' Project	$0	$0	$0	$0	$647,300	$586,700	$60,600	1.1
w/80' Project	$0	$0	$0	$0				
w/100' Project	$0	$0	$0	$0				
Delray Beach (R-175 to R-188)			Period of Analysis 50 Years (1998-2048)					
w/o Project	$81,700	$4,100	$500	$0				
w/20' Project	$26,300	$2,200	$400	$0	$57,400	$43,200	$14,200	1.3
w/40' Project	$100	$0	$0	$0	$86,200	$86,300	($100)	1.0
w/60' Project	$0	$0	$0	$0	$86,300	$129,500	($43,200)	0.7
w/80' Project	$0	$0	$0	$0	$86,300	$172,600	($86,300)	0.5
w/100' Project	$0	$0	$0	$0	$86,300	$215,800	($129,500)	0.4
Highland Beach (R-188 to R-205)			Period of Analysis 50 Years (1989-2039)					
w/o Project	$3,108,000	$86,700	$16,000	$78,200				
w/20' Project	$1,381,700	$5,800	$1,800	$0	$1,899,600	$1,006,000	$893,600	1.9
w/40' Project	$653,200	$1,800	$600	$0	$2,633,300	$1,073,700	$1,559,600	2.5
w/60' Project	$305,600	$1,800	$600	$0	$2,980,900	$1,141,400	$1,839,500	2.6
w/80' Project	$125,900	$0	$0	$0	$3,163,000	$1,209,200	$1,953,800	2.6
w/100' Project	$50,000	$0	$0	$0	$3,238,900	$1,276,900	$1,962,000	2.5
w/120' Project	$12,300	$0	$0	$0	$3,276,600	$1,344,600	$1,932,000	2.4
Boca Raton (R-205 to R-213)			Period of Analysis 50 Years (1989-2039)					
w/o Project	$278,700	$6,800	$1,300	$135,400				
w/20' Project	$0	$0	$0	$0				
w/40' Project	$0	$0	$0	$0	From Table 15)			
w/60' Project	$0	$0	$0	$0	$422,200	$666,800	($244,600)	0.6
w/80' Project	$0	$0	$0	$0				
w/100' Project	$0	$0	$0	$0				

TABLE 17

BROWARD COUNTY ALTERNATIVE PROJECTS ECONOMIC ANALYSIS SUMMARY

Location	Upland Damage	Coastal Armor Damage	Backfill Damage	Prevention of Private Land Loss	Total Average Annual Benefits w/Project	Total Average Annual Costs	Net Annual Benefits	Benefit to Cost Ratio
Deerfield/Hills Beach (R-1 to R-25)		Period of Analysis 50 Years (2000-2050)						
w/o Project	$7,208,700	$57,600	$8,200	$959,900				
w/20' Project	$1,476,500	$3,400	$300	$0	$6,754,400	$573,500	$6,180,900	11.8
w/40' Project	$416,100	$0	$0	$0	$7,818,500	$689,000	$7,129,500	11.3
w/60' Project	$77,500	$0	$0	$0	$8,157,100	$804,500	$7,352,600	10.1
w/80' Project	$13,600	$0	$0	$0	$8,221,000	$920,000	$7,301,000	8.9
w/100' Project	$0	$0	$0	$0	$8,234,600	$1,035,400	$7,199,200	8.0
Pompano (R-26 to R-53)		Period of Analysis 50 Years (2000-2050)						
w/o Project	$1,089,500	$0	$0	$0				
w/20' Project	$286,900	$0	$0	$0	$802,600	$110,200	$692,400	7.3
w/40' Project	$56,400	$0	$0	$0	$1,033,100	$220,300	$812,800	4.7
w/60' Project	$7,900	$0	$0	$0	$1,081,600	$330,500	$751,100	3.3
w/80' Project	$300	$0	$0	$0	$1,089,200	$440,700	$648,500	2.5
w/100' Project	$0	$0	$0	$0	$1,089,500	$550,800	$538,700	2.0
Fort Lauderdale (R-53 to R-74)		Period of Analysis 50 Years (2000-2050)						
w/o Project	$1,985,600	$100	$0	$65,600				
w/20' Project	$643,700	$0	$0	$0	$1,407,600	$780,200	$627,400	1.8
w/40' Project	$146,400	$0	$0	$0	$1,904,900	$897,800	$1,007,100	2.1
w/60' Project	$25,000	$0	$0	$0	$2,026,300	$1,015,400	$1,010,900	2.0
w/80' Project	$1,800	$0	$0	$0	$2,049,500	$1,133,000	$916,500	1.8
w/100' Project	$0	$0	$0	$0	$2,051,300	$1,250,600	$800,700	1.6
J. U. Lloyd (R-86 to R-98)		Period of Analysis 50 Years (2000-2050)						
w/o Project	$0	$0	$0	$0	$0	$0	$0	
w/20' Project	$0	$0	$0	$0	$0	$0	$0	
w/40' Project	$0	$0	$0	$0	$0	$0	$0	
w/60' Project	$0	$0	$0	$0	$0	$0	$0	
w/80' Project	$0	$0	$0	$0	$0	$0	$0	
w/100' Project	$0	$0	$0	$0	$0	$0	$0	
Hollywood/Hallandale (R-101 to R-128)		Period of Analysis 50 Years (2000-2050)						
w/o Project	$793,100	$2,500	$200	$0				
w/20' Project	$459,000	$0	$0	$0	$336,800	$71,500	$265,300	4.7
w/40' Project	$236,300	$0	$0	$0	$559,500	$142,900	$416,600	3.9
w/60' Project	$95,900	$0	$0	$0	$699,900	$214,400	$485,500	3.3
w/80' Project	$32,400	$0	$0	$0	$763,400	$285,900	$477,500	2.7
w/100' Project	$13,200	$0	$0	$0	$782,600	$357,300	$425,300	2.2

TABLE 18

DADE COUNTY ALTERNATIVE PROJECTS
ECONOMIC ANALYSIS SUMMARY

Location	Upland Damage	Coastal Armor Damage	Backfill Damage	Prevention of Private Land Loss	Total Average Annual Benefits w/Project	Total Average Annual Costs	Net Annual Benefits	Benefit to Cost Ratio
Golden Beach (R-1 to R-7) (Aragonite)	Period of Analysis 50 Years (1998-2048)							
w/o Project	$3,082,200	$428,800	$94,700	$154,900				
w/20' Project	$1,369,300	$84,400	$17,600	$0	$2,289,300	$1,353,500	$935,800	1.7
w/40' Project	$683,300	$41,200	$8,400	$0	$3,027,700	$1,465,000	$1,562,700	2.1
w/60' Project	$340,300	$20,200	$4,200	$0	$3,395,900	$1,576,700	$1,819,200	2.2
w/80' Project	$194,000	$11,600	$2,100	$0	$3,552,900	$1,687,800	$1,865,100	2.1
w/100' Project	$73,100	$3,400	$700	$0	$3,683,400	$1,799,700	$1,883,700	2.0
w/120' Project	$18,900	$1,400	$400	$0	$3,739,900	$1,911,200	$1,828,700	2.0
Sunny Isles (R-7 to R-20) (Aragonite)	Period of Analysis 50 Years (1989-2039)							
w/o Project	$536,100	$41,100	$3,800	$0				
w/20' Project	$212,900	$20,200	$2,100	$0	$345,800	$224,200	$121,600	1.5
w/40' Project	$75,600	$9,200	$700	$0	$495,500	$448,300	$47,200	1.1
w/60' Project	$13,300	$900	$200	$0	$566,600	$672,500	($105,900)	0.8
w/80' Project	$3,300	$0	$0	$0	$577,700	$896,800	($319,100)	0.6
w/100' Project	$100	$0	$0	$0	$580,900	$1,120,800	($539,900)	0.5
Bal Harbor/Surfside/Miami Beach	Period of Analysis 50 Years (1982-2032)							
w/o Project	$0	$0	$0	$0				
w/20' Project	$0	$0	$0	$0	$0	$0	$0	
w/40' Project	$0	$0	$0	$0	$0	$0	$0	
w/60' Project	$0	$0	$0	$0	$0	$0	$0	
w/80' Project	$0	$0	$0	$0	$0	$0	$0	
w/100' Project	$0	$0	$0	$0	$0	$0	$0	
Key Biscayne (R-96 to R-113) (Offshore	Period of Analysis 50 Years (2000-2050)							
w/o Project	$69,000	$7,100	$1,600	$0				
w/20' Project	$10,300	$1,300	$400	$0	$65,700	$46,800	$18,900	1.4
w/40' Project	$500	$0	$0	$0	$77,200	$93,500	($16,300)	0.8
w/60' Project	$0	$0	$0	$0	$77,700	$140,200	($62,500)	0.6
w/80' Project	$0	$0	$0	$0	$77,700	$187,000	($109,300)	0.4
w/100' Project	$0	$0	$0	$0	$77,700	$233,700	($156,000)	0.3

Note: This spreadsheet uses mean highwater extensions (ΔX). Costs Developed utilize the "Piggyback" option to distribute mobilization and demobilization costs.

in the project area. This corresponds to a dune formation or sand accretion rate of 1.6 cubic yards per foot per yearover the area. The grassing had performed well in preventing wind blown sand losses, and the formation of the dune had lowered the back beach areas susceptibility to flooding and wave damage (USAED Jacksonville, 1990). Since the wind roses in Region III are similar to the Duval County wind roses and the borrow sand for the beach fill projects are similar also, the 1.6 cubic yards per foot per year accretion rate is reasonable to use for Region III.

242. The plan for the dune grassing at each COFS beach fill project will also be similar to that used in the Duval project. The design parameters are:

a. 14 rows of plants 18" apart and 18" between rows. Plants shall have 10" minimum height. The first two rows on the western side will have Panic Grass followed by 12 rows of Sea Oats toward the ocean.

b. 3" of compost per plant.

c. 90 day maintenance period.

243. During the first three months following planting, the grasses will require watering and fertilization. The grass will require approximately a year to establish to a point where it can trap and control sand.

244. The MCACES cost estimate (See Appendix D) lists the unit cost to plant dunes as $14.50 per linear foot. The maintenance cost per year is $.25 per linear foot. This cost was calculated and annualized for each project modification. The summary of cost savings for each project is listed in Table 19.

245. Nearshore Berms. Nearshore placement of dredged material in the form of a berm can reduce erosional trends to the shore. This results in storm damage reduction, flood control, and recreation benefits. The dredged material is placed in the nearshore zone by split hull barge, submerged pipeline, or other available means in water depths and to crest elevations which will result in the modification of the local wave climate and/or nourishment of the beach profile. Berms can be classified as "stable" when designed to attenuate wave energy and "active" when placed to provide sediment to the littoral zone. The type of nearshore berm constructed depends upon depth of placement, crest elevation, limit to the significant wave motion, and the site specific incident wave climate. For further details on the nearshore berm alternative, see Appendix I.

246. The type of nearshore berm alternatives in Region III are the "active" berms. It was assumed all the material placed in the nearshore zone would move onshore due to its placement within depth of closure. The criteria used in potential sites were:

a) proximity to hardbottom (Site must be at least 200 feet from nearest hardbottom.)

b) placement must be between the 10 to 15 ft. (MLW) isobaths to ensure landward migration.

c) haul distance from borrow location or inlet to be dredged must be reasonable.

d) must be a Federal interest in cost sharing.

247. A list of 21 potential sites meeting the above criteria are in Appendix I (page I-6).

248. The Palm Beach Island (R-91-105) project modification was used as a sample project for cost savings. Any additional fill onshore migrating from the nearshore berm would mean less advance fill needed during renourishment. There are two potential berm sites in the nearshore off the project area. One from R-95 to R-96 and the other from R-97.5 to R-101.5 between 10 and 15 feet water depth. The total capacity for them both is 126,900 cubic yards. It is assumed the dredged material would come from Lake Worth Inlet every two years. It is also assumed that it would take one year for the dredged material to move completely onshore. Unit prices for placement of nearshore berms are found in Table 20. The cost savings analysis is found in Table 21.

249. As can be seen in Table 21, currently there is no cost savings in nearshore berm placement. This is due to the necessary use of special equipment to bring the dredged material close to shore. The existing equipment available for placing sand in 10 to 15 feet of water is too costly. Also, the State of Florida, the study sponsor, is very sensitive concerning sand resources, and does not want to "waste" beach quality sand. If shallow draft hopper dredge and/or barge costs are reduced, or with additional experience, additional project benefits can be derived by use of nearshore berms, this component may later become economically feasible. The nearshore berms have been carefully sized to contain anticipated dredged material disposal volumes from nearby inlets. The non-Federal interests may desire disposal of dredged materials at these sites in the future. The added cost to place sand in the nearshore disposal areas would be non-Federal, because this

TABLE 19
COST SAVINGS SUMMARY

No.	Project	Location	Total Initial Fill With Overfill (Cubic Yards)	Total Average Annual Equivalent Cost of Beach Fill	Total Initial Fill W/Overfill & Grassing (Cubic Yards)	Total Average Annual Equivalent Cost of Beach Fill w/Grassing	Cost Savings With Dune Grassing Per Year
			Palm Beach County				
1.	Jupiter/Carlin	R - 13 to R - 19	No Modification				
2.	Juno Beach/Ocean Cay	R - 27 to R - 41	737,900	$378,590	189,100	138,250	$240,340
3.	N. Palm Beach Island	R - 76 to R - 85	339,400	$567,990	238,600	497,111	$70,879
4.	Palm Beach Island	R - 91 to R - 105	1,025,700	$926,512	868,900	816,256	$110,256
5.	S. Palm Beach Island	R - 116 to R - 132	674,500	$1,040,632	495,300	829,010	$211,622
6.	Ocean Ridge	R - 152 to R - 159	No Modification				
7.	Delray Beach	R - 175 to R - 188	155,295	$43,156	* Incremental Analysis		$43,156
8.	Highland Beach	R - 188 to R - 205	1,900,430	$1,276,855	1,698,606	1,186,600	$90,255
9.	Boca Raton	R - 205 to R - 213	No Modification				
			Broward County				
10.	Deerfield/Hillsboro Beach	R - 1 to R - 25	1,055,820	$804,453	746,700	559,252	$245,201
11.	Pompano/Lauderdale-by-the-Sea	R - 26 to R - 53	600,000	$220,335	* Incremental Analysis		$220,335
12.	Fort Lauderdale	R - 53 to R - 74	858,193	$897,825	505,393	512,944	$384,881
13.	J. U. Lloyd	R - 86 to R - 98	No Modification				
14.	Hollywood/Hallandale	R - 101 to R - 128	720,000	$214,382	* Incremental Analysis		$214,382
			Dade County				
15.	Golden Beach	R - 1 to R - 7	534,660	$783,046	468,420	682,431	$100,615
16.	Sunny Isles	R - 7 to R - 20	146,700	$224,226	* Incremental Analysis		$224,226
17.	Bal Harbor, Surfside, Miami Beach	R - 27 to R - 74	No Modification				
18.	Key Biscayne	R - 101 to R - 113	106,660	$46,748	* Incremental Analysis		$46,748

No.	Project	Location	Cubic Yards Dredged w/o New Sand Transfer Plant for Years 2001-2050	Cubic Yards Dredged w/New Sand Transfer Plant for Years 2001-2050	Cubic Yards Saved w/New Sand Transfer Plant for Years 2001-2050	Total Average Annual Cost Savings
19.	Lake Worth Inlet (75% Reduction in N. Drift Shoaling)	R - 75 to R - 78	4,786,051	2,868,287	1,917,764	$204,230
	Lake Worth Inlet (50% Reduction in N. Drift Shoaling)	R - 75 to R - 78	4,786,051	3,507,544	1,278,507	$146,860

TABLE 20

NEARSHORE BERM UNIT PRICES

Coast of Florida Study - Region III

	Mob & Demob *	Unit Price **	Production ***	Quantity	Distance to D/A	TOTAL COST
	.	($/cubic yard)	(cubic yards/month)	(cy)	(ft)	
PALM BEACH COUNTY						
Palm Beach Island	$400,000	4.45	237,000	2,694,000	30,000	12,388,300
BROWARD COUNTY						
Fort Lauderdale	$400,000	5.35	202,000	713,000	40,000	4,214,550
JU Lloyd	$400,000	6.15	175,000	589,000	50,000	4,022,350
Dania	$400,000	6.55	164,000	87,000	55,000	969,8[illegible]
Hollywood/Hallandale	$400,000	3.00	363,000	766,000	10,000	2,698,000
DADE COUNTY	$400,000					
Golden Beach	$400,000	8.50	126,000	591,000	80,000	5,423,500
Sunny Isles	$400,000	7.65	140,000	430,000	70,000	3,689,500
Bal Harbor, Miami Beach	$400,000	6.85	157,000	191,000	60,000	1,708,350
Minimum Distance to D/A	$400,000	2.20				

*Mob & Demob includes all overhead plus 25% contingency.

**Unit Prices include all overhead plus 25% contingency.

***Assumes 1 medium size hopper dredge with half-load because of depth restrictions.

TABLE 21
NEARSHORE BERM COST SAVINGS ANALYSIS
ESTIMATED RENOURISHMENT COST
BEACH FILL

Project & Item	Quantity	Unit	Unit Cost	Total Cost
Palm Beach Isl				
Mobilization & Demobilization		Lump Sum		$ 420,000
Fixed Costs		Lump Sum		100,000
Sand Fill	372,000	CY	$ 2.85	1,061,340
Environmental Monitoring	1.86	MO	23,000	42,826
Mthly Production Rt			= 200,000cy	
Req. mthly monitoring		= 372,000/200,000		= 1.86
			SUBTOTAL	$ 1,624,166
Contingencies @ 25%				406,042
			SUBTOTAL	$ 2,030,208
Supervision & Administration Engineering & Design @15%				304,531
			TOTAL	$ 2,334,739

ESTIMATED RENOURISHMENT COST
BEACH FILL WITH NEARSHORE BERM

Project & Item	Quantity	Unit	Unit Cost	Total Cost
Palm Beach Island				
Mobilization & Demobilization		Lump Sum		$ 420,000
Fixed Costs		Lump Sum		100,000
Sand Fill	256,000	CY	$ 2.85	729,600
Nearshore Berm	116,000	CY	4.45	516,200
Environmental Monitoring	1.28	MO	23,000	29,440
Mthly Prodtn Rt			= 200,000 cy	
Req. mthly monitoring		= 256,000/200,000		= 1.28
			SUBTOTAL	$ 1,795,240
Contingencies @ 25%				448,810
			SUBTOTAL	$ 2,244,050
Supervision & Administration Engineering & Design @15%				336,608
			TOTAL	$ 2,580,658

NET RENOURISHMENT COST DIFFERENCE

BEACH FILL	$ 2,334,739
BEACH FILL WITH NEARSHORE BERM	2,580,658
NET COST DIFFERENCE	**$ (245,919)**

cost outweighs the cost to place the material directly onshore. With the potential of a cost decrease with the onset of new technology for placement of dredged material nearshore, this alternative may be revisited in the future.

249a. Reduction in Navigation Project O&M Costs. Cost savings were estimated for reducing the amount of material to be removed in future years from the entrance channel for the Palm Beach Harbor Federal navigation project at Lake Worth Inlet. Additional information on the reduction in maintenance dredging required at Palm Beach Harbor is discussed in Appendix D.

249b. It has been estimated (Appendix D) that approximately 53.4 percent of the shoaling at Lake Worth Inlet is caused by north to south littoral drift. It was assumed that half of the shoal material caused by material entering the navigation channel around the north jetty would be intercepted by a new sand transfer system. An average of 25,570 cubic yards would be intercepted based on this assumption. Similarly, interception of 75 percent of the material entering into the channel around the north jetty would result in interception of an average of 38,355 cubic yards of material annually. The peak yardage intercepted under the 75 percent assumption would be 83,497 cubic yards.

249c. The cost savings were determined by using the following procedures. The discussion below is based on assuming a 50 percent reduction in the amount of littoral material shoaling the channel from the north. The reduction in material is shown in Appendix D, Table D-16A. The calculations would be similar for the 75 percent assumption (Table D-16B). The reduction in the amount of dredged material in the year 2001 due to the new sand transfer plant is 55,665 cubic yards. Multiplying 55,665 cubic yards times $3.00 per cubic yard times 1.3 (the estimated engineering and design, supervision and administration rate) yields a cost savings in year 2001 of $217,100. Similar cost savings were calculated for all the future years where maintenance dredging is required. In some years, the volume of maintenance dredging is so low (less than 30,000 cubic yards) that a dredge would not be mobilized, saving $600,000 in mobilization and demobilization costs. These years are horizontally shaded in Tables D-16A and D-16B in Appendix D. When this occurs, the yardage in that particular year is added to the yardage for the following year prior to computing costs.

249d. Cost savings in future years were discounted using the present worth factor appropriate for the particular year of analysis. The present worth of the cost savings for the 50 year analysis period were summed. This sum was then multiplied by the directed interest rate and amortization factor for 50 years to yield total average annual equivalent cost savings of $146,900 (assumes 50 percent of the north to south littoral drift is bypassed). Using similar calculations and the cubic yards saved from Table D16B, the total average annual equivalent cost savings is estimated to be $204,200 (assumes 75 percent of the north to south littoral drift is bypassed). The annual cost of the new sand transfer system is $385,700. Storm damage reduction benefits total $289,900. The benefit to cost ratios for the 50 and 75 percent assumptions are 1.13 and 1.28, respectively.

249e. Cross-shore studies of longshore transport rates were summarized recently by the Corps (EM 1110-2-1502, August 20, 1992). It was found that longshore transport seaward of the wave breakpoint was found to represent about 10 to 20 percent of the total transport. The north to south component of littoral drift at Lake Worth Inlet (from Figure D-25) is 128,000 cubic yards. Ten to 20 percent of this figure is 12,800 to 25,600 cubic yards. Therefore, an average of 102,400 to 115,200 cubic yards of sand would be available for bypassing landward of the wave breaking point annually.

249f. Since the new sand transfer plant has a design capacity of 160,000 cubic yards, the plant should be able to bypass up to 120,000 cubic yards without any difficulty. Interception of 75 percent of the material entering into the channel around the north jetty would result in bypassing an average of 38,355 cubic yards of material annually. The peak yardage bypassed under the 75 percent assumption would be 83,497 cubic yards. Therefore, the assumption that the plant will bypass at least 75 percent of the north to south component of littoral drift is a conservative one. The sand transfer system is still economically justified if the 50 percent assumption is used.

250. Due to current administrative policies, it was prudent to economically justify the Dania and South Lake Worth Inlet Sand Transfer Plant project segments by cost savings alone. If these project segments could decrease the renourishment costs of currently authorized projects, a benefit could be realized by the Federal government as shown in Table 22.

251. End losses to JU Lloyd and Hollywood/Hallandale were determined with and without the Dania project using the GENESIS model to determine cost savings. The sand transfer plant cost savings were based on target bypassing rates and decrease of the renourishment costs to the projects downdrift. Preliminary design costs were identical for the

TABLE 22

COST SAVINGS TO FEDERAL GOVERNMENT

	AVERAGE YEARLY END LOSS (cubic yard)
JU Lloyd	35,000
Hollywood/Hallandale (N. End)	36,000
Hollywood/Hallandale (S. End)	26,000

COST SAVINGS FROM DANIA

	RENOURISHMENT INTERVAL	END LOSS OVER RENOURISHMENT INTERVAL (cubic yard)	COST/ cubic yard		COST SAVINGS/ RENOURISHMENT INTERVAL
JU Lloyd	6	210,000	$4.43		$930,300
Hollywood/Hallandale (N. End)	6	216,000	$4.47		$965,520
				TOTAL	$1,895,820

COST SAVINGS FOR LIFE OF PROJECT	$15,166,560
TOTAL COST FOR DANIA	$12,839,998
TOTAL COST SAVINGS	$2,326,562

COST SAVINGS FROM SOUTH LAKE WORTH INLET STP

SAND TRANSFERRED/ YEAR	COST/ cubic yard	OCEAN RIDGE RENOURISHMENT INTERVAL	COST SAVINGS/ RENOURISHMENT INTERVAL
120,000	$3.08	8	$2,956,800

COST SAVINGS FOR LIFE OF PROJECT	$17,740,800
TOTAL COST FOR SOUTH LAKE WORTH STP	$4,605,600
TOTAL COST SAVINGS	$13,840,800

Lake Worth and South Lake Worth Inlet Sand Transfer Plants ($3,900,000). Yearly Operation and Maintenance cost savings were The difference between O&M costs of the existing and new sand transfer systems for Lake Worth and South Lake Worth Inlets, respectively. This translates to O&M cost savings of $75,000 and $55,200 per year.

252. The Lake Worth Inlet Sand Transfer Plant is justified on reduction in maintenance dredging, reduction in O&M costs, and shore protection benefits. The total average annual equivalent cost savings for reduced maintenance dredging at Palm Beach Harbor was estimated to be $204,200 (assumes 75 percent of the north to south littoral drift is bypassed). The annual cost of the new sand transfer system, including O&M costs, is $585,700. Storm damage reduction benefits for the shoreline south of the inlet total $289,900. The average annual equivalent cost (O&M) of the old plant is $275,000. Net benefits are $183,400 annually, and the benefit to cost ratio is 1.31. Since the construction and operation of a sand transfer system is complex, a feature design memorandum will be required. The report will properly develop and document the engineering and design studies performed during preconstruction, engineering and design and construction. The sand transfer system feature design memorandum will serve as the basis for preparing contract plans and specifications.

RECOMMENDED PLAN

PALM BEACH COUNTY

253. Recommend that the project for Palm Beach County, Florida from Martin County Line to Lake Worth Inlet and South Lake Worth Inlet to Broward County Line, authorized by the River and Harbor Act of 1962 (PL 87-874), be modified and herein after called the Palm Beach County, Florida Shore Protection Project. The following paragraphs describe components of the recommended project segments. Interdependency of the project segments in all three counties are shown in Table 23.

Jupiter Inlet to Lake Worth Inlet Project Segment:

254. Jupiter/Carlin. This existing 1.1 mile beach restoration and periodic nourishment project component is located between DEP monuments R-13 and R-19. The project consists of a beach restoration with a seven year nourishment interval. Initial construction of this project was completed during April 1995. Extension of Federal participation from 10 years from completion of construction to 50 years from the start of construction is recommended. Nearshore berms are not feasible in association with this project area due to the presence of nearshore hardgrounds.

TABLE 23
COAST OF FLORIDA STUDY-REGION III
INTERDEPENDENCE OF SEPARABLE ELEMENTS

POTENTIAL PROJECT	DNR MON. RANGE	PROJECT LENGTH	DEPENDENCY	JUSTIFIED W/O DEPENDENCY?	COMMENTS
PALM BEACH COUNTY					
1. JUPITER/CARLIN Beach Fill	R-13-19	1.1 miles	Dependent	Yes	Existing Project with potential interdependency with Juno/Ocean Cay
2. JUNO/OCEAN CAY Beach Fill; Nearshore Berm	R-27-41	2.75 miles	Dependent	Yes	Existing Project with potential interdependency with Jupiter/Carlin
3. LAKE WORTH INLET Sand Transfer Plant	R-75-78	0.57 mile	Dependent	Yes	New project with potential interdependency with N. Palm Beach Island
4. NORTH-END PALM BEACH I. Beach Fill; Nearshore Berm	R-76-R-85	1.95 miles	Dependent	Yes	New project with potential interdependency with Palm Beach Island and South-End PBI
5. PALM BEACH ISLAND Beach Fill; Nearshore Berm	R-91-R-105	3.1 miles	Dependent		New project with potential interdependency with North-End PBI and South-End PBI
6. S. PALM BEACH ISLAND Beach Fill; Nearshore Berm	R-116-132	3.0 miles	Dependent	Yes	New project with potential interdependency with N. Palm Beach I. and Palm Beach I.
7. SOUTH LAKE WORTH INLET Sand Transfer Plant	R-152-156	.76 miles	Dependent	Yes	New project with potential interdependency with Ocean Ridge
8. OCEAN RIDGE Beach Fill; Nearshore Berm	R-152-159	1.46 miles	Dependent	Yes	Existing Project with potential interdependency with S. Lake Worth STP
9. DELRAY BEACH Beach Fill; Nearshore Berm	R-175-188	2.65 miles	Dependent	Yes	Existing Project with potential interdependency with Highland Beach
10. HIGHLAND BEACH Beach Fill; Nearshore Berm	R-188-203.5	3 miles	Dependent	Yes	New Project with potential interdependency with Delray Beach
11. BOCA RATON Beach Fill; Nearshore Berm	R-205-213	1.45 miles	Independent	Yes	Renourishment Interval precludes interdependency

TABLE 23 (CONTINUED)
COAST OF FLORIDA STUDY-REGION III
INTERDEPENDENCE OF SEPARABLE ELEMENTS TABLE 22

POTENTIAL PROJECT	DNR MON. RANGE	PROJECT LENGTH	DEPENDENCY	JUSTIFIED W/O DEPENDENCY?	COMMENTS
BROWARD COUNTY					
1. Deerfield/Hillsboro Beach Beach Fill	R1-24	4.4 miles	Independent	Yes	Renourishment interval precludes interdependency
2. POMPANO, UNINC., LAUD.-BY-THE-SEA Beach Fill; Nearshore Berm	R-24-53	5.2 miles	Independent	Yes	Renourishment interval precludes interdependency
3. FORT LAUDERDALE Beach Fill	R-53-74	4 miles	Independent	Yes	Location of project precludes interdependency
4. J.U. LLOYD Beach Fill; Nearshore Berm	R-86-98	2.3 miles	Dependent	Yes	Existing Project with potential interdependency with Dania and Hollywood/Hall.
5. DANIA Beach Fill	R-98-101	0.6 mile	Dependent	No	New Project with potential interdependency with JU Lloyd and Hollywood/Hall.
6. HOLLYWOOD/ HALLANDALE Beach Fill; Nearshore Berm	R-101-128	5.3 miles	Dependent	Yes	Existing Project with potential interdependency with JU Lloyd, Dania and Golden Beach

TABLE 23 (CONTINUED)
COAST OF FLORIDA STUDY-REGION III
INTERDEPENDENCE OF SEPARABLE ELEMENTS

POTENTIAL PROJECT	DNR MON. RANGE	PROJECT LENGTH	DEPENDENCY	JUSTIFIED W/O DEPENDENCY?	COMMENTS
DADE COUNTY					
1. GOLDEN BEACH Beach Fill; Nearshore Berm	R-1-7	1.1 miles	Dependent	Yes	New Project with potential interdependency with Hollywood/Hallandale
2. SUNNY ISLES Beach Fill; Nearshore Berm	R-7-20	2.65 miles	Independent	Yes	Renourishment Interval precludes interdependency
3. BAL HAR., SURFSIDE, MIAMI BCH. Beach Fill; Nearshore Berm	R-27-74	9.3 miles	Independent	Yes	Renourishment Interval precludes interdependency
4. KEY BISCAYNE	R-101-113	2.3 miles	Independent	Yes	Location of project and Ren. Interval precludes interdependency

255. Ocean Cay/Juno. This 2.75 mile project component is currently authorized for periodic nourishment as needed and justified. The recommended modification includes adding initial restoration by construction of a design beach with a 55 foot berm, and periodic nourishment between DEP monuments R-27 and R-41. The renourishment interval is seven years. The equilibrium toe of fill, including initial fill plus advance nourishment, is 300 feet. Mitigation for approximately 1.7 acres of hardground impact may be necessary in association with this project component. A nearshore berm site, away from potential hardground impact, has also been identified for use as an alternative maintenance dredged material disposal site. Extension of Federal participation from 10 years from completion of construction to 50 years from the start of construction of this project component is also recommended.

Lake Worth Inlet to South Lake Worth Inlet Project Segment:

256. Recommend that the project for Palm Beach County, Florida for Lake Worth Inlet to South Lake Worth Inlet (Palm Beach Island) authorized in 1958 (PL 85-500) be deauthorized. The following project components for Palm Beach Island would be added as project modifications to the Palm Beach County, Florida (1962) project. Extension of Federal participation from 10 years from completion of construction to 50 years from the start of construction is also recommended for each project component.

257. Lake Worth Inlet. The recommended plan for Lake Worth Inlet requires the construction of a new fixed sand transfer plant to be located north of the inlet with three discharge points located along the dry beach 750, 1,250 and 1,750 feet south of the south jetty on Palm Beach Island. This system would be designed for a target bypassing rate of about 160,000 cubic yards per year to the south, across the inlet, through a 12-in pipeline.

258. The recommended plan for the sand bypassing plant would include:

a. A deposition area north of the north jetty,

b. An array of jet pumps suspended from a pier oriented perpendicular to the shoreline, or a single jet pump deployed by a crane from the north jetty,

c. A clear water pump and pipeline providing water to the jet pumps,

d. An on shore pumphouse containing the clear water pump and a booster pump for transferring the dredged material past the inlet,

e. A slurry pit to ensure the proper ratio of solids to water,

f. An drilled tunneled pipeline under the inlet from north of the north jetty to the south side of the south jetty, and

g. All associated pipe, valves, instruments, and controls required for operation of the system, including three remote controlled discharge valves located within the first 2,250 feet south of the south jetty.

The detailed sand transfer plant design would be determined within a Feature Design Memorandum (FDM) to be prepared during PED.

259. North-end Palm Beach Island. The 1.95 mile beach restoration and periodic nourishment project component located between DEP monuments R-76 and R-85 is authorized (1958), but not constructed. The optimal berm width is 10 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 100,000 cubic yards with a 190 foot toe of fill. The recommended renourishment interval is 4 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 281 feet with a total volume of 239,400 cubic yards. Mitigation for approximately 18 acres of hardground impact may be necessary in association with this project segment. Nearshore berms are not feasible in association with this project component due to the presence of nearshore hardgrounds.

260. Palm Beach Island (Mid-town). The 3.1 mile beach restoration and periodic nourishment project component located between DEP monuments R-91 and R-105 is authorized (1958), but not constructed. The optimal berm width is 25 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 568,400 cubic yards with a 390 foot toe of fill. The recommended renourishment interval is 4 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment is 455 feet with a total volume of 1,025,7800 cubic yards. Mitigation for approximately 3.65 acres of hardground impact may be necessary in association with this project component. Three potential nearshore berm sites have been identified for use as an alternative maintenance dredged material disposal site for the Federal navigation project at Palm Beach Harbor.

261. South-end Palm Beach Island. This 3.25 mile beach restoration and periodic nourishment project component located between DEP monuments R-116 and R-132 is authorized (1958), but not constructed. The optimal berm width is 35 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 248,900 cubic yards with a 350 foot toe of fill. The recommended renourishment interval is 4 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 432 feet with a total volume of 674,500 cubic yards. Mitigation for approximately 5.4 acres of hardground may be necessary in association with this project component.

South Lake Worth Inlet to Boca Raton Inlet Segment:

262. South Lake Worth Inlet. The recommended plan for South Lake Worth Inlet requires the construction, operation and maintenance of a new sand transfer plant to be located north of the inlet with one discharge point located approximately 2,000 feet south of the south jetty. This system would be designed for a target bypassing rate of about 120,000 cubic yards per year. The design would be similar to the Lake Worth Inlet sand transfer plant and would similarly be determined within a Feature Design Memorandum (FDM) during PED studies.

263. Ocean Ridge. The 1.35 mile beach restoration and periodic nourishment project component located between DEP monuments R-152 and R-159 is authorized (1962), but not constructed. This project is scheduled for construction by Palm Beach County during 1996. The optimal berm width is 60 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 770,000 cubic yards and includes 8 years of advance nourishment. The annual advance nourishment is 62,600 cubic yards. Two nearshore berm sites, however, have been recommended as potential dredged material disposal sites. Extension of federal participation from 10 years from completion of construction to 50 years from the start of construction is recommended.

264. Delray Beach. The recommended 2.7 mile beach restoration and periodic nourishment project component located between DEP monuments R-175 and R-188 is authorized and constructed. This project is recommended for modification with an additional 20 feet optimal berm width at elevation +9.0 feet NGVD and slopes of 1:20 berm to MLW and 1:30 from MLW to existing bottom. The recommended additional design volume is 155,300 cubic yards with a 290 foot equilibrium toe of fill. No hardgrounds exist in the vicinity of this project so no mitigation will be required.

Although this project component is a considerable distance from either inlet, an extensive nearshore berm site offshore of this project component is recommended as a potential dredged material disposal site. The Delray project has been extended to 50 years of Federal participation by Assistant Secretary of Army (Civil Works) under Section 934.

265. Highland Beach. The 3.4 mile beach restoration and periodic nourishment project component located between DEP monuments R-188 and R-205 is a modification to the authorized (1962) periodic nourishment project. It would fill in a gap between two authorized projects for lessening end losses. The optimal berm width of this project component is 120 feet at elevation +9.0 feet NGVD, and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 1,017,450 cubic yards with a 350 foot toe of fill. The recommended renourishment interval is 7 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 450 feet with a total volume of 1,900,430 cubic yards. Mitigation for approximately 1.9 acres of hardground may be necessary for this project component. One nearshore berm site has been identified offshore of this project coastline. Extension of Federal participation from 10 years from completion of construction to 50 years from the start of construction is recommended.

266. Boca Raton. The 1.65 mile beach restoration and periodic nourishment project component located between DEP monuments R-205 and R-213 is authorized and constructed. Extension of Federal participation from 10 years from completion of construction to 50 years from the start of construction is recommended. Another recommended modification to this project component is a nearshore berm site as an alternative maintenance dredged material disposal site.

Other Palm Beach County Project Segment Alternatives:

267. As previously discussed, specific recommendations for the 1.9 miles of northern the Palm Beach County shoreline, north of Jupiter Inlet, will be addressed in the Region IV COFS study. In addition to the above specific project components, periodic nourishment as necessary and justified is an existing project feature for Palm Beach County, Florida. No modification of this project feature is recommended for the economic life of the project. Dune grassing, as necessary and justified is also recommended for the Palm Beach County shoreline as a cost effective project feature.

BROWARD COUNTY

Boca Raton Inlet (Palm Beach County) to Hillsboro Inlet (Broward County) Segment:

268. **Deerfield Beach/Hillsboro Beach (Segment I).** The 4.4 mile beach restoration and periodic nourishment project segment located between DEP monuments R-1 and R-24 is authorized, but not constructed. The optimal berm width is 30 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 746,700 cubic yards with a 300 ft toe of fill. The recommended renourishment interval is 7 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 406 feet with a total volume of 1,055,820 cubic yards. Mitigation for approximately 4.65 acres of hardground may be necessary in association with this project segment. A nearshore berm dredged material disposal site has been identified and recommended offshore this project shoreline. It is also recommended that Federal participation in this project segment be extended from 10 years from completion of construction to 50 years from the start of construction.

269. Hillsboro Inlet. Navigation improvements are being considered for the outer channel at this inlet to provide additional advanced maintenance for the entrance channel as part of the Hillsboro Inlet, Florida, Federal navigation project. Two alternatives are being evaluated. One alternative is as designed and contained within a permit request by the sponsor. The other is an alternative designed by Jacksonville District. The recommendations for this navigation project will be addressed in a separate navigation report which will address related potential impacts to the adjacent shorelines.

Hillsboro Inlet to Port Everglades Inlet Segment (Segment II):

270. Pompano/Lauderdale-By-The-Sea. The 5.2 mile beach restoration and periodic nourishment project component located between DEP monuments R-24 and R-53 is authorized and constructed. This project is recommended for modification with an additional 35 feet optimal berm width at elevation +9.0 feet NGVD and slopes of 1:20 berm to MLW and 1:30 from MLW to existing bottom. The recommended additional design volume is 600,000 cubic yards with a resulting equilibrium toe of fill of 365 feet. Mitigation for approximately 12.25 acres of hardground may be necessary in association with this project segment modification. A nearshore berm dredged material disposal site has been identified and recommended off this project shoreline.

Extension of Federal participation in this project segment from 10 years from the completion of construction to 50 years from the start of construction is also recommended.

271. Fort Lauderdale. This 4.0 mile project segment area located between DEP monuments R-53 to R-74 is authorized for periodic nourishment. A beach restoration and periodic nourishment project component modification is recommended. The recommended optimal berm width is 25 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 466,700 cubic yards. The recommended renourishment interval is 6 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 500 ft with a total volume of 858,193 cubic yards. Federal participation to 50 years from the start of construction of this project component is recommended. Mitigation for approximately 8.1 acres of hardground impact may be necessary in association with this project component. Nearshore berms are not feasible in association with this project component due to the presence of nearshore hardgrounds.

Port Everglades Inlet (Broward County) to Bakers Haulover Inlet (Dade County):

Broward County (Segment III):

272. Segment III of the Broward County project includes two authorized beach restoration and periodic nourishment project sections, J. U. Lloyd and Hollywood/Hallandale. Extension of Federal participation to the 50 year economic life of these projects was approved by Assistant Secretary of Army (Civil Works) under Section 934 in September 1992.

273. J.U. Lloyd. The 2.3 mile beach restoration and periodic nourishment project component located between DEP monuments R-86 and R-98 is authorized and constructed. The optimal berm width in the re-analysis of this project remains at 100 feet at elevation +10 feet NGVD and slopes of 1:15 berm to MLW and 1:30 from MLW to existing bottom. The design volume, including initial fill and advance nourishment is 1,032,000 cubic yards. The renourishment interval is 6 years. The only recommended modification to this project segment is a nearshore berm site as an alternative maintenance dredged material disposal site.

274. Hollywood/Hallandale. The 5.25 mile beach fill project located between DEP monuments R-101 and R-128 is authorized and constructed. This project is recommended for modification with an additional 50 feet optimal berm width at elevation +7.0 feet NGVD and slopes of 1:15 berm to MLW

and 1:40 from MLW to existing bottom. The recommended additional design volume is 720,000 cubic yards resulting in a project equilibrium toe of fill of 230 feet. The renourishment interval is 6 years. No hardgrounds exist in the immediate vicinity of this project so no mitigation will be required. A nearshore berm dredged material disposal site has been identified offshore of this project segment.

275. Dania. This 0.6 mile reach of beach is presently authorized for periodic nourishment. A modification to a beach restoration and periodic nourishment project is recommended for this project segment component located between DEP monuments R-98 and R-101. Initial restoration of the beach at Dania would fill in the gap between J.U. Lloyd and Hollywood/Hallandale. Due to the small project length, the fill would be designed as a transition between these two all ready constructed projects and help reduce end losses in Segment III.

276. The optimal berm width transition between J. U. Lloyd and Hollywood/Hallandale is 125 feet, on the average (i.e., between 100 and 150 feet), with a transition berm height between elevation +10.0 feet and +7.0 NGVD and slopes of 1:15 berm to MLW and 1:40 from MLW to existing bottom. The initial design volume is 208,300 cubic yards. The recommended renourishment interval is 6 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 220 feet with a total volume of 460,840 cubic yards. Federal participation in the economic life of this transition project component is recommended.

Other Broward County Project Segment Alternatives:

277. In addition to the above specific project segments, periodic nourishment as necessary and justified is an existing project feature to the Broward County, Florida project. No change in this project feature is recommended at this time. Dune grassing, as necessary and justified is also recommended for the Broward County shoreline as a cost effective project feature.

DADE COUNTY

Continuation of Port Everglades Inlet (Broward County) to Bakers Haulover Inlet (Dade County):

278. Golden Beach. It is recommended that the Dade County, Florida, Beach Erosion Control and Hurricane Protection Project be modified to include initial restoration and periodic nourishment for the 1.2 mile shoreline located between DEP monuments R-1 and R-7 in Dade County. This project component would fill in a gap between the Dade

County and Broward County authorized projects, decreasing project end losses.

279. The optimal berm width in the analysis of this project is 100 feet at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 311,000 cubic yards with a 260 foot toe of fill. The recommended renourishment interval is 6 years. The distance to the recommended equilibrium toe of fill, including initial fill plus advance nourishment is 832 feet with a total volume of 534,660 cubic yards. Mitigation for approximately 5.25 acres of hardground impact may be necessary in association with this project segment. One nearshore berm site has been identified as an alternative maintenance dredged material disposal site.

280. Sunny Isles. The 2.65 mile beach fill project segment component located between DEP monuments R-7 and R-20 is authorized and constructed. This segment of the Dade County, Florida project is recommended for modification with an additional 20 feet optimal berm width at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The recommended additional design volume is 146,700 cubic yards with an additional 200 foot toe of fill extension. No hardgrounds exist in the vicinity of this project so no mitigation will be required. One nearshore berm site has been identified as an alternative maintenance dredged material disposal site.

Bakers Haulover Inlet to Government Cut:

281. Bal Harbour, Surfside, Miami Beach. The 9.3 mile beach fill project segment located between DEP monuments R-27 and R-74 is authorized and constructed. The only recommended modifications to this project segment are the addition of four nearshore berm sites that have been identified as an alternative maintenance dredged material disposal sites.

282. Government Cut. As identified in a previous DM, a sand tightening of Government Cut has been recommended. This sand tightening will help reduce end losses to the southern portion of the Miami Beach project segment and further reduce Government Cut maintenance dredging requirements. The sand tightening project will be undertaken as a separate project modification.

Project Segments South of Government Cut:

283. Virginia Key/Northern Key Biscayne. Shore protection of Virginia Key and northern Key Biscayne was authorized by the River and Harbor Act of 1962 (PL 87-874). Construction of the 1.8 mile Virginia Key shoreline and 1.9 mile northern Key Biscayne shoreline was completed in 1969. The Virginia Key shoreline was renourished in 1972 and 13 groins were also constructed. This project was deauthorized in 1990. As documented in the 1992 Rehabilitation Report following Hurricane Andrew, in August 1992, the Virginia Key project was found to be performing well to date. No project segment modification is recommended for Virginia Key at this time.

284. Key Biscayne. The 2.3 mile beach fill project located between DEP monuments R-101 and R-113 was initially constructed in 1985 under the authority of Section 103 of the 1962 River and Harbor Act. Nourishment for 50 years was authorized, however, the Federal limit of $1,000,000 under Section 103 has been met. It is recommended that the Dade County project be modified to incorporate this project segment so that Federal participation in periodic nourishment can be continued through the economic life of this project segment. An additional optimal berm width of 10 feet at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom is recommended. The additional project design volume is 106,660 cubic yards. The recommended renourishment interval is 7 years.

Other Dade County Project Segment Alternatives:

285. In addition to the above specific project segment modifications, periodic nourishment as necessary and justified is recommended for all Atlantic Ocean shorelines within Dade County for the economic life of each project segment. Dune grassing, as necessary and justified is also recommended for the Dade County shoreline as a cost effective project feature.

RECOMMENDED PLAN COST SUMMARY

285a. Costs for the Recommended Plans in Palm Beach, Broward, and Dade Counties can be found in Tables 24, 25, and 26, respectively.

PLAN IMPLEMENTATION

Cost Allocation

286. Section 103(d) of the Water Resources Development Act of 1986 (Public Law 99-662) specifies that the cost of construction measures for beach erosion control are assigned to the appropriate purpose(s) specified in Section 103(c) of the Act. These purposes are normally hurricane and damage reduction and/or separable recreation, and shared in the same percentages as to the purposes to which the costs are

TABLE 24
PALM BEACH COUNTY
SUMMARY OF COSTS AND BENEFITS
NED PLAN SEGMENTS

	Juno/Ocean Cay	Lake Worth Inlet	North Palm Beach	Palm Beach Island
COSTS				
First Cost (MCACES)	$4,236,200	$3,914,300	$7,977,000	$6,572,600
Interest During Construction	$81,500	$75,300	$153,500	$126,500
Sand Transfer Plant O&M		$200,000		
TOTAL AVERAGE ANNUAL COST	$631,600	$585,700	$897,600	$1,214,100
BENEFITS				
Storm Damage Reduction	$4,385,000	$289,900	$1,125,000	$5,431,500
Recreation	$813,700	$0	$115,200	$1,164,300
Maintenance Dredging Cost Redu	$0	$204,200	$0	$0
Eliminate Oper/Maint of STP		$275,000		
TOTAL ANNUAL BENEFITS	$5,198,700	$769,100	$1,240,200	$6,595,800
BENEFIT-TO-COST RATIO	8.23	1.31	1.38	5.43
NET ANNUAL BENEFITS	$4,567,100	$183,400	$342,600	$5,381,700

	South Palm Beach	Delray Beach	Highland Beach
COSTS			
First Cost (MCACES)	$5,989,100	$565,300	$7,812,300
Interest During Construction	$115,300	$10,900	$150,300
TOTAL AVERAGE ANNUAL COST	$1,370,700	$109,000	$1,157,200
BENEFITS			
Storm Damage Reduction	$3,364,700	$57,300	$3,238,900
Recreation	$0	$3,118,700	$1,074,800
TOTAL ANNUAL BENEFITS	$3,364,700	$3,176,000	$4,313,700
BENEFIT-TO-COST RATIO	2.45	29.1	3.7
NET ANNUAL BENEFITS	$1,994,000	$3,067,000	$3,156,500

TABLE 25
BROWARD COUNTY
SUMMARY OF COSTS AND BENEFITS
NED PLAN SEGMENTS

	Deerfield Beach	Pompano	Ft. Lauderdale
COSTS			
First Cost (MCACES)	$ 7,136,800	$ 8,628,300	$ 11,886,600
Interest During Construction	$ 137,300	$ 199,200	$ 228,700
TOTAL AVERAGE ANNUAL COST	$ 896,600	$ 810,600	$ 1,683,400
BENEFITS			
Storm Damage Reduction	$ 8,157,100	$ 1,033,100	$ 2,026,300
Recreation	$ 62,000	$ 286,500	$ 28,900
TOTAL ANNUAL BENEFITS	$ 8,219,100	$ 1,319,600	$ 2,055,200
BENEFIT-TO COST RATIO	9.20	1.60	1.20
NET ANNUAL BENEFITS	$ 7,322,500	$ 509,000	$ 371,800

	Hollywood	Dania
COSTS		
First Cost (MCACES)	$ 3,567,500	$ 2,282,700
Interest During Construction	$ 68,700	$ 43,900
TOTAL AVERAGE ANNUAL COST	$ 805,300	$ 362,900
BENEFITS		
Storm Damage Reduction	$ 699,900	$ 4,385,000
Recreation	$ 292,100	not computed
TOTAL ANNUAL BENEFITS	$ 992,000	$ 4,385,000
BENEFIT-TO COST RATIO	1.20	12.10
NET ANNUAL BENEFITS	$ 186,700	$ 4,022,100

TABLE 26
DADE COUNTY
SUMMARY OF COSTS AND BENEFITS
NED PLAN SEGMENTS

	Key Biscayne	Golden Beach	Sunny Isles
COSTS			
First Cost (MCACES)	$ 330,000	$ 14,173,500	$ 2,200,000
Interest During Construction	$ 9,200	$ 272,700	$ 58,000
TOTAL AVERAGE ANNUAL COST	$ 63,700	$ 1,886,800	$ 330,000
BENEFITS			
Storm Damage Reduction	$ 65,700	$ 3,683,300	$ 345,800
Recreation	$ 0	$ 0	$ 0
TOTAL ANNUAL BENEFITS	$ 65,700	$ 3,683,300	$ 345,800
BENEFIT-TO COST RATIO	1.00	2.00	1.00
NET ANNUAL BENEFITS	$ 2,000	$ 1,796,500	$ 15,800

assigned, except no costs are assigned to incidental recreation. Hurricane and storm damage reduction projects are cost shared at 65 percent Federal, and separable recreation projects are cost shared at 50 percent Federal. Cost sharing for beach erosion control measures must also consider shore ownership and use. Additional guidance oncost sharing for shore protection projects is provided in Engineering Regulation 1165-2-130 dated June 15, 1989.

286a. Section 940 of the WRDA of 1986 specifies cost allocation for shore damage mitigation. Costs for implementation of structural and nonstructural measures for the prevention or mitigation of shore damages attributable to Federal navigation works (including lands, easements, rights-of-way, relocations and disposal areas) are cost shared in the same proportion as the cost sharing provisions applicable to the project causing the shore damage. Specific Congressional authorization of a shore damage mitigation project is required if the Federal first cost exceeds $2,000,000.

286b. A non-Federal public body must agree to operate and maintain such measures, and in the case of interests in real property acquired in conjunction with nonstructural measures, to operate and maintain the property for public purposes in accordance with regulation prescribed by the Secretary of the Army. The Federal Government will not incur costs for access rights on properties a shore mitigation project is designed to protect.

287. Normally, non-Federal public shores are dedicated to park and conservation areas, and the benefits of protecting such shores are based on the loss of recreation outputs, with costs shared at 50 percent Federal and 50 percent non-Federal. Public parks and street ends in the project areas are also cost shared at 50 percent Federal and 50 percent non-Federal since the primary output for this shorefront is recreation. The cost sharing for protection of privately-owned shores resulting in public benefits is 65 percent Federal and 35 percent non-Federal. The cost for protection of undeveloped private lands is a 100 percent non-Federal responsibility. An example summary table of shore ownership and level of Federal participation for the 3 mile Jupiter/Juno reach in Palm Beach County is displayed in Table 27.

288. The cost of establishing the State's required erosion control line (ECL) is a non-Federal cost. Once this line has been approved, all project lands fronting the developed private shore within the project are considered open to use by the public. Federal projects consist of the project built both seaward and landward of the ECL. All

TABLE 27

JUPITER/JUNO SHORE PROTECTION PROJECT: APPORTIONMENT OF COSTS
COAST OF FLORIDA STUDY - REGION III

PROFILE LINE NUMBER (A)	LOT DESCRIPTION (B)	LOT WIDTH (FT) (C)	SHORELINE DESCRIPTION (D)	WITHIN PROJECT LIMITS (E)	WITHIN 1/4 MILE OF ACCESS (F)	SHORE 1/ OWNERSHIP AND PROJECT PURPOSE (G)	LEVEL OF FEDERAL PART'N (H)	FEDERAL PARTICIPATION TIMES LOT WIDTH ((C)*(H)) (I)
R-13	JUPITER INLET BCH PK	400	PUBLIC BEACH	Y	Y	II.B.	50.00%	200.0
	subtotal	400					50.00%	200.0
R-14	JUPITER INLET BCH PK	560	PUBLIC BEACH	Y	Y	II.B.	50.00%	280.0
	OCEAN TRAIL CONDO	190	DEVELOPED	Y	Y	II.A.	65.00%	123.5
	subtotal	750					53.80%	403.5
R-15	OCEAN TRAIL CONDO	870	DEVELOPED	Y	Y	II.A.	65.00%	565.5
	subtotal	870					65.00%	565.5
R-16	OCEAN TRAIL CONDO	240	DEVELOPED	Y	Y	II.A.	65.00%	156.0
	JUPITER BCH HILTON	395	DEVELOPED	Y	Y	II.A.	65.00%	256.8
	PRIVATE LOT	250	UNDEVELOPED	Y	Y	IV.	0.00%	0.0
	subtotal	885					46.64%	412.8
R-17	PRIVATE LOT	50	UNDEVELOPED	Y	Y	IV.	0.00%	0.0
	PRIVATE LOT	520	UNDEVELOPED	Y	Y	IV.	0.00%	0.0
	PRIVATE LOT	220	UNDEVELOPED	Y	Y	IV.	0.00%	0.0
	subtotal	790					0.00%	0.0
R-18	CARLIN PARK	1350	PUBLIC BEACH	Y	Y	II.B.	50.00%	675.0
	subtotal	1350					50.00%	675.0
R-19	CARLIN PARK	1210	PUBLIC BEACH	Y	Y	II.B.	50.00%	605.0
	subtotal	1210					50.00%	605.0
R-20	CARLIN PARK	950	PUBLIC BEACH	Y	Y	II.B.	50.00%	475.0
	JUPITER REEF CLUB	350	DEVELOPED	Y	Y	II.A.	65.00%	227.5
	subtotal	1300					54.04%	702.5

TABLE 27 (CONTINUED)

JUPITER/JUNO SHORE PROTECTION PROJECT: APPORTIONMENT OF COSTS
COAST OF FLORIDA STUDY - REGION III

PROFILE LINE NUMBER (A)	LOT DESCRIPTION (B)		LOT WIDTH (FT) (C)	SHORELINE DESCRIPTION (D)	WITHIN PROJECT LIMITS (E)	WITHIN 1/4 MILE OF ACCESS (F)	SHORE 1/ OWNERSHIP AND PROJECT PURPOSE (G)	LEVEL OF FEDERAL PARTN (H)	FEDERAL PARTICIPATION TIMES LOT WIDTH ((C)*(H)) (I)
R-21	JUPITER REEF CLUB		290	DEVELOPED	Y	Y	II.A.	65.00%	188.5
	PUBLIC BEACH		750	PUBLIC BEACH	Y	Y	II.B.	50.00%	375.0
		subtotal	1040					54.18%	563.5
R-22	PUBLIC BEACH		1060	PUBLIC BEACH	Y	Y	II.B.	50.00%	530.0
		subtotal	1060					50.00%	530.0
R-23	PUBLIC BEACH		1080	PUBLIC BEACH	Y	Y	II.B.	50.00%	540.0
		subtotal	1080					50.00%	540.0
R-24	PUBLIC BEACH		1120	PUBLIC BEACH	Y	Y	II.B.	50.00%	560.0
		subtotal	1120					50.00%	560.0
R-25	PUBLIC BEACH		965	PUBLIC BEACH	Y	Y	II.B.	50.00%	482.5
		subtotal	965					50.00%	482.5
R-26	PUBLIC BEACH		1030	PUBLIC BEACH	Y	Y	II.B.	50.00%	515.0
		subtotal	1030					50.00%	515.0
R-27	PUBLIC BEACH		1115	PUBLIC BEACH	Y	Y	II.B.	50.00%	557.5
		subtotal	1115					50.00%	557.5
R-28	PUBLIC BEACH		985	PUBLIC BEACH	Y	Y	II.B.	50.00%	492.5
		subtotal	985					50.00%	492.5

TABLE 27 (CONTINUED)

JUPITER/JUNO SHORE PROTECTION PROJECT: APPORTIONMENT OF COSTS
COAST OF FLORIDA STUDY - REGION III

PROFILE LINE NUMBER (A)	LOT DESCRIPTION (B)	LOT WIDTH (FT) (C)	SHORELINE DESCRIPTION (D)	WITHIN PROJECT LIMITS (E)	WITHIN 1/4 MILE OF ACCESS (F)	SHORE 1/ OWNERSHIP AND PROJECT PURPOSE (G)	LEVEL OF FEDERAL PARTN (H)	FEDERAL PARTICIPATION TIMES LOT WIDTH ((C)*(H)) (I)
TOTALS FOR PROJECT		15,950	SHORELINE LENGTH (Feet)					
		3.0	SHORELINE LENGTH (Miles)			SUM OF COLUMN (I) IN FEET =		7,805

THE SUM OF COLUMN (I) DIVIDED BY 15,950 FEET = 48.94 PERCENT
WHICH IS THE FEDERAL SHARE OF CONSTRUCTION COSTS SUCH AS ADVANCE
NOURISHMENT COSTS WHICH ARE LINEARLY DISTRIBUTED ALONG THE PROJECT.

1/ SHORE OWNERSHIP AND PROJECT PURPOSE
(As defined in ER 1165-2-130)

		Max Level Fed Participation Construct Costs
I.	Federally Owned	100.00%
II.	Publicly and Privately Owned – Protection Results in Public Benfits.	
A.	Hurricane and Storm Damage Reduction	65.00%
B.	Private and Public Land Open for Public Use – Recreation	50.00%
C.	Separable Recreation	50.00%
III.	Privately Owned, Use Limited to Private Interests	0.00%
IV.	Privately Owned, Undeveloped	0.00%

construction landward of the ECL on private property is 100 percent non-Federal. Periodic nourishment is considered "construction" for cost sharing purposes.

289. The apportionment of project costs are determined for both linear and non-linear costs. The volume of design fill placed along a given reach of project shoreline varies considerably. The cost to construct the design section is therefore a non-linear cost. Linear costs are those project costs which are uniformly distributed throughout the length of the project (i.e., periodic nourishment and overfill costs). Linear costs are also costs applied to the projects as a whole, such as mobilization and demobilization costs, monitoring, contingencies, engineering and design, contract supervision and contract administration.

290. Revised Policy Guidance Letter 11 (issued by CECW-RP, 21 April 1989) directs the use of the "Federal rule of valuation" which provides for an offset of benefits in determining compensation for properties including severance. Lands seaward of the ECL may have value; credit for these lands will be based on the Federal rules of valuation. The non-Federal project sponsor is entitled to credit for administrative costs incurred in providing lands for Federal projects except for lands in front of vacant private lots. The administrative costs for upland temporary construction easements are not part of the Federal total project costs and are a non-Federal responsibility.

Cost Apportionment

291. Table 28 shows the apportionment of costs for the beach fill project modifications based on analysis similar to Table 27. The cost-sharing for the Lake Worth Inlet Sand Transfer Plant will be 100 percent Federal due to mitigation of the adverse effects of the Federal deep draft navigation project at Lake Worth Inlet (Palm Beach Harbor). The South Lake Worth Sand Transfer Plant is designed for a target bypassing rate of 120,000 cubic yards per year. The sediment deficit on the south side of the inlet is 98,000 cubic yards. A surplus volume of 22,000 cubic yards per year will occur when the South Lake Worth Sand Transfer Plant is in operation, which is 18 percent of the total volume. The Federal Share will be 65 percent of that percentage for a total of 12 percent. The Non-Federal Share will be 88 percent.

292. Final apportionment is based on current law and conditions of shore ownership and use at the time of project construction or subsequent nourishment, except for the shore damage mitigation project at Lake Worth Inlet. Public

TABLE 28

COAST OF FLORIDA STUDY - REGION III
COST APPORTIONMENT - INITIAL CONSTRUCTION

Project		Federal Share	Non-Federal Share
PALM BEACH COUNTY			
1.	Juno Beach/Ocean Cay	44.10%	55.90%
2.	Lake Worth Inlet Sand Transfer Plant	100.00%	0.00%
3.	N. Palm Beach Island	59.40%	40.60%
4.	South Lake Worth Inlet Sand Transfer Plant	12.00%	88.00%
5.	Palm Beach Island	32.20%	67.80%
6.	S. Palm Beach Island	50.70%	49.30%
7.	Delray Beach	57.90%	42.10%
8.	Highland Beach	60.60%	39.40%
BROWARD COUNTY			
9	Deerfield/Hillsboro Beach	40.00%	60.00%
10.	Pompano	64.30%	35.70%
11.	Fort Lauderdale	55.90%	44.10%
12.	Dania	65.00%	35.00%
13.	Hollywood/Hallandale	62.50%	37.50%
DADE COUNTY			
14.	Golden Beach	65.00%	35.00%
15.	Sunny Isles	38.30%	61.70%
16.	Miami Beach	59.80%	40.20%
17.	Key Biscayne	48.90%	51.10%

ownership and use of the mitigation project at Lake Worth Inlet is not required. Cost sharing for non-linear costs (i.e., the quantity of design volume) for the shore protection projects would be based on the last physicalsurvey of shoreline conditions prior to construction. This survey is normally the contract plans and specifications survey.

Federal Responsibility

293. The U. S. Army Corps of Engineers is responsible for budgeting for the Federal share of construction costs for Federal civil works projects. Federal funding is subject to budgetary constraints inherent in the formation of the national civil works budget for a given fiscal year. The Corps will perform the necessary planning, engineering, and design needed prior to construction. The Corps will provide an O&M manual to the sponsor. The Corps will obtain all necessary permits including State water quality certification. The Corps will construct the projects with an upfront cash contribution from the non-Federal project sponsors, except for construction of the sand transfer plant at Lake Worth Inlet, which would be constructed at Federal expense.

Non-Federal Responsibility

294. The non-Federal project sponsors would provide an up-front cash contribution for initial construction of proposed projects. The non-Federal sponsors would also provide the entire cost of all material placed on undeveloped private lands and share in the placement of fill on developed private lands and public lands landward of the ECL, except for the shore damage mitigation project at Lake Worth Inlet. The costs for lands, easements, and rights-of-way and a portion of the administrative costs associated with land requirements are also a non-Federal responsibility. Although Federal implementation of a Federal shore damage mitigation project may include costs for lands, easements, rights-of-way, relocations, and disposal areas, the Federal Government will not incur costs for access rights over or on properties the mitigation proposal is designed to protect. The sponsor of a Federal navigation mitigation project must agree to operate and maintain the structural and non-structural measures of the shore damage mitigation project.

Other Non-Federal Requirements

295. Other general non-Federal responsibilities including continued public use of the project beach, control of water pollution to safeguard the health of bathers, and operation and maintenance of the project beaches must be assumed by the non-Federal sponsor. Operation and maintenance activities include beach berm reshaping and beach tilling. The delineation of Federal and non-Federal responsibilities will be defined in the project cooperation agreement (PCA) for each proposed project.

295a. Corps policy normally forbids the placement of fill to renourish lands landward of the ECL unless the sponsor has acquired the right to provide public access to such lands or unless there is some other Federal interest for such placement of fill behind the ECL. Engineering necessity may provide such a Federal interest, as where the stability of the slope of a sand dune requires the deposit of sand on private land. Also, the need to taper the ends of a renourishment area of a beach or maintain continuity may require the inclusion of small segments of private lands. However, absent a Federal interest, renourishment fill will not be placed behind the ECL.

Financial Analysis

296. Financial analysis is required for any plan being considered for Corps of Engineers implementation that involves non-Federal cost sharing. The ultimate purpose of the financial analysis is to ensure that non-Federal sponsors understand the financial commitment involved and have reasonable plans for meeting that commitment. The financial analysis shall include the non-Federal sponsor's statement of financial capability, the non-Federal sponsor's financing plan, and a Corps assessment of the sponsor's financial capability.

STUDY SUMMARY

297. This report summarizes the preconstruction studies conducted for Region III in the interest of beach erosion control and storm damage prevention. Based on these studies, the following was concluded:

298. Storm damage may impact 21.8 miles of Atlantic shoreline in Palm Beach County, 21.0 miles of Atlantic shoreline in Broward County and 16.7 miles of Atlantic Shoreline in Dade County. The amount of shorefront development threatened by storms is $2,150,022,525 in Palm Beach County, $3,053,709,269 in Broward County and $1,612,470,515 in Dade County.

299. A contributing factor to the susceptibility to storm damage is relative sea level rise. If the upper limit of relative sea level rise actually occurs, it will increase the shoreline recession and storm damages estimated within this report.

300. The most practical and economical means to prevent or reduce structural damages is to construct the authorized shore protection projects as modified herein.

301. The non-Federal sponsors, Palm Beach, Broward, and Dade Counties, as well as numerous municipalities, support construction of the projects.

ENVIRONMENTAL CONSIDERATIONS

302. The alternative plans identified herein have been formulated with environmental data and constraints taken into consideration, i.e., where possible, the projects were developed considering a 200-foot buffer around identified nearshore hardground areas and a 400-foot buffer around identified hardground areas adjacent to borrow sites. The draft Environmental Impact Statement (EIS) is included in this report. The use of Aragonite and upland sand sources as a potential source of borrow material is also addressed in the draft EIS and the Geotechnical Appendix (Appendix E).

FLOOD PLAIN DEVELOPMENT

303. The authorized shore projects and proposed project modifications, as well as the proposed shore damage mitigation project, are in the base flood plain (100-year flood), and have been evaluated in accordance with Executive Order 11988. Relocation of the projects outside the flood plain would not be responsive to the problems and needs of the study area and was not considered further. A non-flood plain alternative for the potential development with the projects would be to restrict all future development to those areas outside the flood plain or elevated above the flood plain. Potential flood plain development as a result of project implementation would be minimal. The continued nourishment of projects would have minimum impact on the natural and beneficial values of the flood plain. In the without project flood plain (that area immediately adjacent to the project), there will be minimal loss of natural resources due to potential development. Implementation of any non-structural plans that would minimize potential damage to or within the flood plain beyond those laws and regulations already adopted by local and State interests are not viable solutions under the planning constraints of this study.

FLOOD PLAIN MANAGEMENT AND FLOOD INSURANCE PROGRAMS COMPLIANCE

304. Section 402 of the Water Resources Development Act of 1986 (PL 99-662) as amended by Section 14 of the Water Resources Development Act of 1988 (PL 100-676) states

"Before construction of any project for local flood protection or any project for hurricane or storm damage reduction, the non-Federal interests shall agree to participate in and comply with applicable Federal flood plain management and flood insurance programs." To date, Palm Beach, Broward, and Dade Counties are enrolled in and in compliance with the national Flood Insurance Program.

USE OF OUTER CONTINENTAL SHELF LANDS

305. The Outer Continental Shelf Lands Act (OCSLA) enacted August 7, 1953, as amended (enclosed) grants the Secretary of the Interior authority to grant to qualified persons offering the highest competitive bid leases of any mineral other than oil, gas, and sulfur in any area of the Outer Continental Shelf. The OCSLA was amended by Section 1 of Public Law 103-426, October 31, 1994. The Secretary of the Interior may negotiate the use of Outer Continental Shelf sand, gravel and shell resources for use in a program of, or project for, shore protection, beach restoration or coastal wetlands restoration undertaken by a Federal, State or local government agency; or for a project that is funded in whole or in part by or authorized by the Federal Government. Section 1(a)(2)(B) of the 1994 amendment prohibits the assessment of any fees against an agency of the Federal government, directly or indirectly.

306. Any Federal agency which proposes to make use of sand, gravel and shell resources subject to the OCSLA shall enter into a Memorandum of Agreement with the Secretary of the Interior. The Secretary of the Interior is also required to notify the Committee on Merchant Marine and Fisheries and the Committee on Natural Resources of the House of Representatives, and the Committee on Energy and Natural Resources of the Senate on any proposed project for the use of those resources prior to the use of those resources.

307. There are borrow sites for Palm Beach County located on the Outer Continental Shelf and none for Broward and Dade Counties. However, there are numerous sites within the three mile limit. It would be highly unlikely that an Outer Continental Shelf borrow site would be used in Region III.

COASTAL BARRIER RESOURCES ACT

308. The proposed shore protection project modifications, and the proposed shore damage mitigation project, do not include any recommendations which would result in any new Federal expenditures or financial assistance prohibited by the Coastal Barrier Resources Act (Public Law 97-348); nor were funds obligated in past years for the authorized and constructed project segments in Palm Beach, Broward, and Dade Counties for purposes prohibited by this Act.

COASTAL ZONE MANAGEMENT ACT

309. The Coastal Zone Management (CZM) Act of 1972, as amended (PL 92-583) requires all Federal activities inside or outside a state's coastal zone to be consistent with the state's coastal zone management plan if the activities affect natural resources, land uses, or water uses within the coastal zone. By issuance of State Water Quality Certifications on completed shore protection projects in Region III, the State has determined that the authorized projects for which initial construction has been completed were consistent with the State CZM Act. The State will review future project work to determine if it is consistent with the State's coastal zone management plan prior to any future project construction or future nourishment of any previously constructed projects.

COST EFFECTIVENESS OF DESIGN

310. Section 911 of Public Law 99-662 requires a cost effectiveness review of project designs for water resources projects which have a total cost in excess of $10,000,000, and for which construction has not been initiated by November 17, 1986. The review shall employ cost control techniques which will ensure that such projects are designed in the most cost-effective way for the life of the project. Engineering Circular No. 1110-2-259 dated February 1, 1989 provides guidance for implementing cost control techniques for projects in accordance with Section 911.

311. The District Engineer will certify, based on the recommendations of the project design review teams, that the designs achieved in the preconstruction, engineering and design phases are the most cost effective designs.

PUBLIC ACCESSIBILITY

312. In determination of the Federal interest in cost-sharing, Federal participation is limited to the areas where adequate public parking and access are provided, except for the proposed shore damage mitigation project at Lake Worth Inlet. Federal participation is limited to those shoreline reaches within 1/4 mile from an access point, a reasonable walking distance for a beach visitor. For shoreline reaches farther than 1/4 mile from public parking and/or beach access point, Federal participation will not be provided, unless, public accessibility is improved prior to project construction. In areas, where public access requirements were not met, the cost apportionment was adjusted to be 100 percent Non-Federal.

CONCLUSIONS

313. The Coast of Florida Erosion and Storm Effects Study, Region III, provided an opportunity to evaluate coastal problems and alternatives on a regional basis. As a result, new innovative and cost effective erosion control measures were considered. In addition, the data collected as part of the Region III study have been assimilated into a geographic information system. The Region III database provides a quantitative body of knowledge for use by coastal engineers and planners in the evaluation of management schemes and solutions which address erosion, storm damage, and coastal flooding problems.

314. Consideration has been given to all significant aspects of the authorized projects in the overall public interest, including engineering feasibility, economic, social and environmental effects. Modifications to authorized projects and the development of new projects described in this report provide the optimum solution for protection of upland development for Region III.

RECOMMENDATIONS

315. The Administration's Civil Works Program reflects the President's commitment to focus limited Federal budgetary resources on the development of water resources projects and purposes that have national significance. Accordingly, the Administration is not budgeting for any new construction starts for shore protection projects or studies, which are best left to state and local governments. The U.S. Army Corps of Engineers has begun a phase out of the Corps' role in shore protection and beach erosion control. The current phase of each study, project, or separable element will be completed but new phases will not be initiated.

315a. Accordingly, I do not recommend that the existing projects for Region III, Palm Beach, Broward and Dade Counties be modified in accordance with the selected plan described in this report, with the exception of the Dania, Lake Worth Sand Transfer Plant and South Lake Worth Sand Transfer Plant projects. These projects, as discussed herein, provide costs savings to the Federal Government in reducing required renourishment volumes for the lives of previously authorized projects. I further recommend that the Federal navigation project at Palm Beach Harbor be modified to include Federal construction of a new sand transfer system at Lake Worth Inlet in order to mitigate for the adverse effects of the navigation project on the downdrift shoreline.

316. These recommendations are made with the provision that the project sponsor will enter into a written Project Cooperation Agreement, as required by Section 221 of PL 91-611, as amended, to provide local cooperation satisfactory to the Secretary of the Army. Such local cooperation shall provide the following non-Federal responsibilities:

a. * Provide 35 percent of total project costs assigned to hurricane and storm damage reduction plus 50 percent of total project costs assigned to recreation, plus 100 percent of total storm damage project costs assigned to privately owned shores (where use of such shores is limited to private interests), and as further specified below:

a. (1) * Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the construction, operation, and maintenance of the Project.

a. (2) * Provide all improvements required on lands, easements, and rights-of-way to enable the proper disposal of dredged or excavated material associated with the construction, operation, and maintenance of the project. Such improvements may include, but are not necessarily limited to, retaining dikes, waste weirs, bulkheads, embankments, monitoring features stilling basins, and dewatering pumps and pipes.

a. (3) * Provide, during construction, any additional amounts as are necessary to make its total contribution equal to 35 percent of total project costs assigned to hurricane and storm damage reduction plus 50 percent of total storm damage project costs assigned to recreation, plus 100 percent of total project costs assigned to privately owned shores (where use of such shores is limited to private interests).

b. * For so long as the Project remains authorized, operate, maintain, repair, replace, and rehabilitate the completed Project, or functional portion of the Project, at no cost to the Federal Government, in a manner compatible with the Project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government.

c. * Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the Non-Federal Sponsor, now or hereafter, owns or controls for access to the Project for the purpose of inspection, and, if necessary after failure to perform by the Non-Federal Sponsor, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the Project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Federal Government shall operate to relieve the Non-Federal Sponsor of responsibility to meet the Non-Federal Sponsor's obligations, or to preclude the Federal Government from pursuing any other remedy at law or equity to ensure faithful performance.

d. * Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the Project and any Project-related betterments, except for damages due to the fault or negligence of the United States or its contractors.

e. * Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the Project in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20.

f. * Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law (PL) 96-510, as amended, 42 USC 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the construction, operation, and maintenance of the Project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the Non-Federal Sponsor with prior specific written direction, in which case the Non-Federal Sponsor shall perform such investigations in accordance with such written direction.

g. * Assume complete financial responsibility, as between the Federal Government and the Non-Federal Sponsor for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, or maintenance of the Project.

h. * As between the Federal Government and the Non-Federal Sponsor, the Non-Federal Sponsor shall be considered the operator of the project for the purpose of CERCLA liability. To the maximum extent practicable, operate, maintain, repair, replace and rehabilitate the Project in a manner that will not cause liability to arise under CERCLA.

i. * Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for the construction, operation, and maintenance of the Project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

j. * Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."

k. * Provide 35 percent of that portion of total historic preservation mitigation and data recovery costs attributable to hurricane and storm damage reduction that are in excess of one percent of the total amount authorized to be appropriated for hurricane and storm damage reduction.

l. * Provide 50 percent of that portion of total historic preservation mitigation and data recovery costs attributable to recreation that are in excess of one percent of the total amount authorized to be appropriated for recreation.

m. * Provide 100 percent of that portion of total historic preservation mitigation and data recovery costs attributable to privately owned shores (where use of such shores is limited to private interests) that are in excess of one percent of the total amount authorized to be appropriated for privately owned shores (where use of such shores is limited to private interests).

n. * Participate in and comply with applicable Federal floodplain management and flood insurance programs.

o. * Publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the floodplain and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with the protection provided by the project.

P. * For so long as the storm damage project remains authorized, the Non-Federal Sponsor shall ensure continued conditions of public ownership and use of the shore upon which the amount of Federal participation is based, except that public ownership of the shore damage mitigation project at Palm Beach Harbor is not required.

q. * Provide and maintain necessary access roads, parking areas, and other public use facilities, open and available to all on equal terms, except that public ownership of the storm damage mitigation project at Palm Beach Harbor is not required.

317. The recommendations contained herein reflect the information available at this time, and current Department of the Army policies and Federal law governing formulation of individual project modifications. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program, nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations for modifications to authorized storm damage reduction projects, recommendations for new storm damage reduction projects, and the recommendation for shore damage mitigation project at Palm Beach Harbor, and information in this report may be modified before it is transmitted to higher authority as proposals for project modification and/or implementation funding.

Terry L. Rice
Colonel, U. S. Army
District Engineer

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CERTIFICATION OF PUBLIC ACCESSIBILITY
COAST OF FLORIDA, REGION III, SHORE PROTECTION PROJECTS

1. As part of the obligations established in the project cooperation agreement for the Coast of Florida, Region III, Shore Protection Projects, the non-Federal sponsor shall assure continued conditions of public ownership and public use of the shore upon which Federal participation is based during the economic life of the project. The non-Federal sponsor shall also provide and maintain necessary access roads, parking areas and other public use facilities, open and available to all on equal terms. Public accessibility and use of the shore damage mitigation project recommended for Palm Beach Harbor are not required for such projects.

2. In the determination of the Federal interest in cost sharing, Federal participation was limited for the storm damage reduction projects to areas where adequate parking and access are available. For shoreline reaches further than 1/4 mile from public parking and/or beach access points, Federal participation was not provided.

3. A recreation benefit analysis is presented in Appendix F. The project areas has sufficient parking to meet the peak demand on any day of the year.

4. I therefore conclude that there is reasonable public beach access and use of the project beaches in all areas where Federal participation is provided.

Terry L. Rice
Colonel, U.S. Army
District Engineer

REPORT OF THE DIVISION COMMANDER

[First Endorsement]

CESAD-ET-PL (CESAJ-PD-PC/28 Oct 96) (10-1-7a)
Mr. Meyer/bjg/404-331-4326
SUBJECT: Coast of Florida Erosion and Storm Effects Study; Region III; Palm Beach, Broward, and Dade Counties, Florida

Commander, South Atlantic Division, U.S. Army Corps of Engineers, Room 322, 77 Forsyth Street, SW., Atlanta, Georgia 30303-3490
28 NOV 1996

FOR CDR, HQUSACE, ATTN: CECW-ZA, WASH DC 20314-1000

I concur in the recommendation of the District Engineer.

Encl

R. N. MARTIN
Colonel, EN
Deputy Commander

NOTE: MAIN TEXT PLATES HAVE NOT BEEN PRINTED.

For copies of the main text plates, contact the U.S. Army Corps of Engineers, Jacksonville District, Planning Division, 400 West Bay Street, Jacksonville, Florida, 32232-0019, Telephone: (904) 232-3833

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October 1996

Final Report

Contract No. DACW17-94-D-0018
Delivery Order No. 0002
GEC Project No. 27307402

ENVIRONMENTAL IMPACT STATEMENT FOR COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY, REGION III, PALM BEACH, BROWARD, AND DADE COUNTIES, FLORIDA

Prepared for

U.S. Army Corps of Engineers
Jacksonville District
Jacksonville, Florida

Prepared by

Gulf Engineers & Consultants, Inc.
Baton Rouge, Louisiana

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY, REGION III, PALM BEACH, BROWARD, AND DADE COUNTIES, FLORIDA

The responsible lead agency is the U.S. Army Corps of Engineers (USACE), Jacksonville District. The non-Federal sponsor is the State of Florida, Department of Environmental Protection.

ABSTRACT: In response to authority granted in Section 104, Public Law 98-360, the USACE instituted a study to review past projects and studies pertaining to shoreline erosion to develop a plan for future shoreline erosion mitigation projects. The Coast of Florida Erosion and Storm Effects Study (COFS) is a regional plan to address shoreline erosion and storm damage through beach nourishment, dune stabilization, and construction of sand transfer plants. The entire Florida coastline was divided into planning regions based on distinct morphologic and climate differences. Region III includes Palm Beach, Broward, and Dade counties and is the focus of this Environmental Impact Statement (EIS). The current combination of alternatives was developed based on logistical, political, and economic feasibility.

Under the currently proposed combination of alternatives, beaches would be restored through beach fill and nearshore berm placement. Permanent sand transfer plants are proposed for Lake Worth and South Lake Worth inlets. The use of Bahamian sand for sand starved areas in Broward and Dade counties is proposed as a sand source alternative. Sea turtles, primarily the loggerhead sea turtle, should benefit from the 215 additional acres of new beach that can be used for nesting, although appropriate pre- and post-mitigation of nourishment activities may be required. Adverse encounters with other endangered species is possible but unlikely. Impacts to approximately 61 acres of nearshore hardground would occur from their burial during nourishment activities, and temporary impacts to beach fill and borrow site soft bottom communities would occur as well. Turbidity and sedimentation impacts are likely in the short-term for all borrow and fill zones; however, buffer zones around borrow sites should minimize impacts in these areas. Water, air, noise, cultural resources, and recreation should not be significantly affected from any COFS action alternatives; however, minor temporary impacts during alternative implementation is likely. Additional recreational benefits attributable to the projected 215 acres of new beach created by the recommended plan could have an average annual benefit of approximately $8.7 million. While possible, mechanical damage to offshore reefs is unlikely with the use of buffer zones within which dredging activity would not be allowed. The regional economy would generally be unaffected by COFS activities; however, avoided storm damages for the 10 to 20-year storm from COFS alternative implementation could equal as great as $33 million. Energy requirements would be insignificant, and no significant irretrievable or irreversible commitments to resources are likely under the proposed combination of alternatives.

Of the proposed alternatives addressed, only three project segments are recommended for Federal participation at this time. These are sand transfer plants at Lake Worth and South Lake Worth Inlets and beach nourishment at Dania, Florida. This reflects the President's commitment to focus limited Federal budgetary resources on the development of water resources projects and purposes that have national significance.

The no-action alternative would allow beach erosion to continue, further decreasing available nesting habitat and recreational beach acreage in Region III. Storm damages in excess of $33 million would be realized over that which would be expected under the proposed combination of alternatives.

PLEASE SEND COMMENTS
TO THE DISTRICT ENGINEER
WITHIN 30 DAYS OF PUBLICATION
OF THE DRAFT EIS IN THE
FEDERAL REGISTER

If you would like further information
on this statement, please contact:
Mr. Michael Dupes, CESAJ-PD-ER
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019
Telephone: (904) 232-1689

NOTE: Information, displays, maps, etc. discussed in the COFS Report are incorporated by reference in the EIS.

1.0 SUMMARY

1.1 Major Conclusions

Beaches along the Region III shoreline are in differing stages of erosion that require specific plans of action to reestablish beaches and protect them from storm damages. To economize in the planning and implementation of these projects, they have been aggregated into a regional plan that is presently analyzed in reference with the no-action alternative, which assumes that no nourishment operations would be completed outside of those already funded and in operation. The currently proposed combination of alternatives (selected plan) involves several types of actions including beach nourishments, nearshore berm placements, and sand transfer plants. These projects have the collective goal of reestablishing the beaches that have been degraded through anthropogenically disturbed littoral movement and storm damage. At this time however, only the sand transfer plants at Lake Worth and South Lake Worth Inlets and the beach nourishment at Dania are being recommended for Federal participation. Refer to section 2.4 of the EIS.

The selected plan would generally have only temporary impacts due to the nature of the activities. However, some impacts would have more enduring effects than others. Water turbidity in the vicinity of operations would generally increase during the borrow and nourishment activities; however, these impacts would be temporary and insignificant. Some turbidity associated impacts to hardgrounds near borrow areas may also occur, but mitigation efforts, namely buffer zones, should minimize these effects. Nourishment activities would avoid sensitive turtle nesting windows as well as be operated per the prescribed constraints of the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS); thus, impacts to sea turtles should be minimal and within allowable "taking" levels. An estimated 100, 91, and 24 acres of new beach would be created in Palm Beach, Broward, and Dade counties, respectively, which could benefit nesting sea turtles. Borrow operations would be conducted according to NMFS guidelines, minimizing the potential for takes of sea turtles in the borrow site area. Impacts to the endangered Indian manatee would likewise be minimal, with the implementation of operational requirements dictated by the USFWS. It is unlikely that other endangered species would be significantly impacted in an adverse manner from borrow or nourishment operations.

Preliminary estimates suggest that approximately 31, 25, and 5 acres of hardgrounds, in Palm Beach, Broward, and Dade counties, respectively, would be buried or otherwise impacted from nourishment activities associated with the recommended plan. However, mitigation measures would negate any habitat losses realized from hardground coverage associated with nourishment activities. Mechanical damage to hardgrounds is possible with borrow operations, although unlikely with the use of buffer zones and state-of-the-art navigation and positioning equipment. Temporary impacts associated with turbidity and sedimentation are likely in hardground areas flanking borrow sites, although efforts to minimize these impacts will be made through the establishment of buffer zones and other measures.

Direct effects on the regional economy from the implementation of proposed combination of alternatives (borrow, nourishment, or other associated activities) should be minor; however, projected 10- and 20-year storm damages as great as $33 million could be avoided. Cultural resources should not be affected by the proposed action; however, in the event that underwater archaeological remains are discovered during operations, appropriate action will be taken to minimize disturbance and insure integrity of the finding. Recreational resources should generally benefit with greater beach widths for beach activities. An estimated 100, 91, and 24 acres of additional beach would be created in Palm Beach, Broward, and Dade counties, respectively under the recommended plan. Benefits from this additional beach have been estimated to have an average annual equivalent recreational benefit as great as a $8.7 million in Region III. However, increased turbidity levels may temporarily affect some hardground areas presently used by recreational divers. Long-term coverage of some hardground areas would be replaced with other habitat areas that could also be used by divers after colonization.

1.2 Areas of Controversy

Several areas of controversy exist for the COFS project. These are discussed below:

Use of Bahamian Sand for Nourishment Activities in Broward and Dade Counties. Bahamian sand has been proposed as a compatible nourishment sand for beaches in Broward and Dade counties. Only one nourishment project to date has been studied (Fisher Island renourishment, Lutz *et al.*, 1993), and some entities believe that the lighter color of the sand that yields slightly cooler temperatures in sea turtle nests could lead to a proportionally greater number of male hatchlings. To date, no definitive studies on this issue have been documented.

Impacts on Sea Turtles. In addition to the issues surrounding the use of Bahamian sand, there is general concern that nourishment and borrow activities could lead to an unacceptable number of sea turtle "takes." This concern relates to the timing of activities, the compaction and slope of nourished beaches, and the operation plans (lighting and dredge-type) for borrow and nourishment operations. Consultation with the USFWS and the NMFS has resulted in a set of operational guidelines that will minimize "takes" of sea turtles.

Impacts on Sea Grass Beds. Although dense and relatively dense sea grass bed locations have been well mapped by the Florida Marine Research Institute (FMRI), sparse grass beds located in inlets and nearshore softbottoms are not fully mapped. There is a concern that unmapped, sparse beds near borrow or nourishment areas may be affected by increased turbidity levels and direct coverage associated with nourishment activities. Prior to borrow and nourishment activities, site reconnaissance will reveal any significant unmapped sea grass beds. Information from reconnaissance surveys will help in operational plans to avoid significant adverse impacts to these beds.

Impacts on Hardgrounds. Several concerns exist over the projected impacts to hardground areas in the nearshore and vicinity of the borrow areas. Generally, there is a concern that associated turbidity and sedimentation impacts to hardgrounds are not fully understood and that they may be understated herein. The available literature has been reviewed and suggests that although impacts are likely, they are not likely to be permanent. Furthermore, with the observance of buffer zones, associated turbidity and sedimentation, and mechanical impacts should be minimized.

1.3 Unresolved Issues

As noted in the section 1.2, Areas of Controversy, several of these controversial issues are unresolved. Specifically, impacts associated with the use of Bahamian sand are not fully documented for south Florida beaches. More specifically, the effects of Bahamian sand on sea turtle nesting are not definitively documented at this time. In addition to the unresolved concerns regarding Bahamian sand, the effects of increased turbidity and sedimentation on hardgrounds in both the nearshore and borrow areas are not fully understood. Although impacts would occur to hardgrounds from nourishment activity burial and can definitively be projected, the relationships among turbidity, sedimentation, and mortality are not definitive for all species in nearshore and borrow area hardgrounds. Therefore, although estimates of hardground impacts are provided herein, the precise amount of hardground mitigation needed for the implementation of the recommended plan is unresolved at this time.

1.4 Environmental Impact Tiering

Although location-independent and general impacts associated with the proposed action are discussed in this report, location-specific impacts with regard to borrow areas and nourishment activities are reserved for future tiered documentation (40 CFR §1508.28) that will be developed as project-specific details become available.

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1.0 NEED AND OBJECTIVE OF ACTION

1.1 Authority

The Coast of Florida Erosion and Storm Effects Study (COFS) is conducted in response to Section 104 of Public Law (PL) 98-360, an Appropriations Act for the fiscal year ending 30 September 1985, and a resolution dated 8 August 1984 by the Committee on Public Works and Transportation, of the U.S. House of Representatives, which provide for the following:

1.1.1 Section 104, PL 98-360. The Secretary of the Army, acting through the Chief of Engineers, is authorized to review, in cooperation with the State of Florida, its political subdivision, agencies and instrumentalities thereof, all previous published reports of the Chief of Engineers pertaining to shoreline erosion on the entire coast of Florida with a view to determining whether any modifications of the recommendations contained therein are advisable at this time, with particular reference to developing a comprehensive body of knowledge, information, and data on coastal area changes and processes.

1.1.2 House Resolution. Resolved by the Committee on Public Works and Transportation of the U.S. House of Representatives that the Secretary of the Army, acting through the Chief of Engineers, in accordance with the provisions of Section 110 of the River and Harbor Act of 1962, is hereby authorized to study, in cooperation with the State of Florida, its political subdivision and agencies and instrumentalities thereof, the entire coast of Florida, including a determination of whether any modifications of the recommendations contained in previously published reports of the Chief of Engineers pertaining to shoreline erosion on the coast of Florida are advisable, and also including the development of a comprehensive body of knowledge, information, and data on coastal area changes and processes for such entire coast.

1.2 Public Concerns

The primary public concern within Region III for COFS is the ongoing shoreline recession and corresponding vulnerability to storm damages. All of Florida's 8,400 miles of tidal shoreline are low-lying and vulnerable to storm surge and other storm associated damage. However, other concerns gleaned from initial scoping efforts include: (1) the potential impact of Bahamian sand on sea turtle nests; (2) the impacts of nearshore hardgrounds from nourishment burial; and (3) the need for certain projects.

Shoreline recession continues to be a problem along Florida's coastline. The net long-term sediment transport rate along the east coast of Florida is generally from north to south, with some localized flow reversals associated with complex hydrodynamic interactions at tidal inlets and/or some localized net long-term cross-shore (onshore or offshore) transport associated with localized bathymetric irregularities. In general, as a result of the reduced wave climate (shielding from the Bahama banks), the sediment transport rate is reduced from the north to the south. Based on current management strategies, shoreline recession will continue. Sea-level rise and other natural and man-induced activities that influence the natural sediment transport processes will tend to maintain shoreline recession.

Tidal inlets have a tendency to interrupt the normal littoral transport of sediments along the coastline. If left to nature, these inlets would have a tendency over the long-term to restore the natural bypassing of sediments along the coast. Conflicts occur as a result of the multi-purpose uses desired in the coastal zone. The need to maintain inlet channels for commercial and recreational navigation, improve water quality characteristics in the interior water bodies, and maintain recreational uses of the adjacent beaches often result in conflicting and competing interests. For a detailed discussion of the need of COFS, see the ***Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996,*** U. S. Army Corps of Engineers (USACE), Jacksonville District.

1.3 Planning Objectives

The major Federal and state planning objectives for the COFS include: (1) reduction of expected storm damages through beach nourishment and other project alternatives; (2) reestablish beaches to a degree suitable for beach recreation; (3) maintain suitable beach habitat for nesting sea turtles, and invertebrate and shorebird species; and (4) maintain commerce associated with beach recreation in Region III.

The approach taken in the COFS is to investigate the coastal processes and natural resources on a regional basis, instead of a conventional project by project basis to develop enhanced and/or new storm damage reduction projects along the studied coastline. To effectively manage and support such a comprehensive and extensive study, the State has been divided into the following five coastal regions based on distinct differences between the areas, such as wave climate, coastal processes, and native beach characteristics: Region I - panhandle; Region II - peninsular gulf coast to the northern extent of the Keys; Region III - southern east coast; Region IV - central east coast; and Region V - northern east coast.

The focus of this report and the first region to be studied is Region III. This region includes northern Dade County from the southern end of Key Biscayne throughout Broward County, and to Jupiter Inlet in northern Palm Beach County. The remaining 1.9 miles of Palm Beach County, north of Jupiter Inlet, is part of the Region IV littoral zone and will be examined in detail during that portion of the COFS. Region III was identified as the first region for study since it is the most densely populated coastal region in Florida and has the largest local, state, and Federal investment in shore protection. Within the 91 miles of Region III shoreline, there are 61 miles of initial beach restoration authorized as part of Federal shore protection projects. The Federal Government, in cooperation with the State of Florida and local sponsors, has constructed approximately 35 miles of protective and recreational beach projects, and planning is underway for additional projects. For a detailed discussion of the purpose and objectives of COFS, see the ***Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996,*** USACE, Jacksonville District.

2.0 ALTERNATIVES

2.1 Alternative Selection Process

The alternative plans considered were developed through a three-step process:

1. Identification and preliminary assessment of possible solutions. At this phase, benefits and costs had not been completed.

2. Development and assessment of intermediate-level-of-detail alternatives. Unit price cost estimates and benefits were computed. Includes general discussion of potential environmental impacts.

3. Development and assessment of detailed alternative plans. Cost code of account-level cost estimates were computed, including the costs of lands, easements, rights-of-way, and mitigation. Also, detailed benefits were computed, and Federal and non-Federal cost allocations were discussed in this phase.

Each step was iterative in the process of identifying and selecting the best course of action. Each alternative was considered in light of other projects within each reach or problem area. During the first step, the types of alternatives developed included traditional projects, programs that could be carried out by non-Federal interests, and all suggestions by participants in meetings and workshops. Each plan in the array was screened based on its ability to satisfy the planning objectives. The viable plans were carried forward into the intermediate level of detail and analysis and were developed sufficiently to assess generalized benefits, costs, and impacts. Those plans meriting closer evaluation were carried into the third step, development and analysis of alternative plans on a detailed level. The alternatives considered are listed below. (For a detailed discussion of the alternatives, see the *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996,* USACE, Jacksonville District.)

- No-action
- Rezoning of beach area
- Modification of building codes
- Construction of setback line
- Moratorium on construction
- Flood Insurance
- Evacuation planning
- Establish a no-growth program
- Condemnation of land and structures
- Various nonstructural combinations
- Revetment
- Beach fill with periodic nourishment

- Beach fill with periodic nourishment stabilized by an offshore breakwater or submerged artificial reef
- Beach nourishment with maintenance material from updrift inlet
- Beach fill and periodic nourishment stabilized by groins
- Seawalls
- Beach fill with periodic nourishment and hurricane surge protection sand dune
- Beach fill with periodic nourishment and hurricane surge protection - offshore breakwaters or submerged artificial reefs
- Nearshore berms
- Beach fill with nearshore berms
- Stabilization of beaches and dunes by vegetation
- Feeder beach
- Relocation of structures
- Flood proofing of structures
- Abandon or modify navigation projects
- Sand tightening of jetties
- Upgrading on construction of sand transfer plants for renourishment
- Use of sand from offshore borrow areas for beach fill
- Use of beach compatible sand from the maintenance dredging of navigational channels for beach
- Use of upland sand sources for beach fill
- Use of Bahamian sand for beach fill
- Various combinations of the above

2.2 Alternatives Eliminated From Further Discussion

Several alternatives were not evaluated further than the initial screening. Economic viability, effectiveness, political and social palatability, and combinations thereof made several options infeasible. Further information on the planning process of developing the present combination of alternatives is contained in the ***Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996***, U.S. Army Corps of Engineers (USACE), Jacksonville District. It should be emphasized that per 40 CFR §1502.14, the no-action alternative was not eliminated from further discussion. Projected trends and resulting conditions under the no-action alternative serve as valuable reference points from which proposed action impacts are gauged.

2.3 No-Action Alternative

The no-action alternative assumes that the existing trends will continue unabated into the future. This alternative assumes that no Federal nourishment activities would occur other than those already in operation, and those that have been approved under the National Environmental Protection Act (NEPA) process. Under the no-action alternative, beaches will continue to recede, decreasing the available area for beach recreational activities; however, additional nearshore hardgrounds would become exposed under this alternative, increasing hardground habitat and the corresponding potential for recreational diving resources in the nearshore area. Expected beach recession under the no-action alternative would also decrease the natural attenuation of wave damage during future storm events. Post-storm clean-up and repair activities would become correspondingly more expensive and labor intensive under the no-action alternative. Furthermore, expected beach recession under the no-action alternative might also endanger sea turtle nests through inundation, which would not be mitigated under Federal control.

2.4 Currently Proposed Combination Alternatives (Selected Plan)

The COFS feasibility report examines alternatives for three Federal shore protection projects (Palm Beach County, Broward County, and Dade County) containing 21 project segment elements. These project segments are described below and illustrated in summary in tables 2.1 through 2.3. Information, displays, maps, etc. discussed in the COFS report are incorporated by reference in the EIS. However, of the 21 segments, actions within only three segments are recommended for Federal participation at this time. These are: 1) Lake Worth Inlet Sand Transfer Plant, 2) South Lake Worth Inlet Sand Transfer Plant (STP), and 3) beach nourishment along 0.6 miles of beach at Dania, Florida. The Lake Worth Inlet STP is recommended as a modification to the Federal navigation project at Palm Beach Harbor to mitigate for the adverse effects of the navigation project on the downdrift shoreline. The Dania beach nourishment and South Lake Worth Inlet STP would provide significant cost savings to future nourishments of existing shore protection projects. This reflects the President's commitment to focus limited Federal budgetary resources on the development of water resources projects and purposes that have national significance. Refer to the syllabus and to sections 315 and 315a of the COFS feasibility report.

2.4.1 Palm Beach County

2.4.1.1 Recommend that the project for Palm Beach County, Florida from Martin County Line to Lake Worth Inlet and South Lake Worth Inlet to Broward County Line, authorized by the River and Harbor Act of 1962 (PL 87-874), be modified and herein after called the Palm Beach County, Florida Shore Protection Project. The following paragraphs describe components of the recommended project segments.

2.4.1.2 Jupiter Inlet to Lake Worth Inlet Project Segment.

2.4.1.2.1 Jupiter/Carlin. This existing 1.1 mile beach restoration and periodic nourishment project component is located between Florida Department of Environmental Protection (DEP) monuments R-13 and R-19. The project consists of a beach restoration with a seven year nourishment interval. Initial construction of this project was completed during April 1995. Extension of Federal participation from 10 years to the economic life of the project is recommended. Nearshore berms are not feasible in association with this project area due to the presence of nearshore hardgrounds.

2.4.1.2.2 Ocean Cay/Juno. This 2.75 mile project component is currently authorized for periodic nourishment as needed and justified. The recommended modification includes adding initial restoration by construction of a design beach with a 55 foot berm, and periodic nourishment between DEP monuments R-27 and R-41. The renourishment interval is seven years. Approximately 18.3 acres of new beach would be created under this alternative. The equilibrium toe of fill, including initial fill plus advance nourishment, is 300 feet. Mitigation for approximately 1.7 acres of hardground impact may be necessary in association with this project component. A nearshore berm site, away from potential hardground impact, has also been identified for use as an alternative maintenance dredged material disposal site. Extension of Federal participation from 10 years to the economic life of this project component is also recommended.

Table 2.1. Presently Proposed Combination of Alternatives: Palm Beach County

Category	Jupiter/Carlin	Ocean Cay/Juno	Lake Worth Inlet	North Palm Beach Island	Palm Beach Island	South Palm Beach Island	South Lake Worth Inlet	Ocean Ridge	Delray Beach	Highland Beach	Boca Raton
Structural Protection Measures											
Revetment											
Beach fill and periodic nourishment	A,C	A,M	PL	A	A	A	PL	A	A,C,M	A,M	A,C
Maintenance nourishment from updrift inlet											
Seawalls											
Surge protection sand dune											
Nearshore berms		US			US			US	PL	US	PL,M
Stabilize beach and dunes with vegetation											
Feeder beach											
Relocate structures											
Flood proof structures											
Abandon/modify navigation project											
Sand tighten jetty											
Sand trap											
Upgrade/construct sand transfer plant			PL				PL				
Non-Structural Protective Measures											
Rezoning beach area											
Modify building codes											
Construction Setback											
Construction moratorium											
Flood insurance											
No growth program											
Condemnation of land and structures											

NOTES: A = Authorized; C = Constructed; PL = Planned; US = Under Study; M=Modification

Source: USACE, 1996, *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III*, Jacksonville District: Jacksonville, Florida.

Table 2.2. Presently Proposed Combination of Alternatives: Broward County

Category	Deerfield Beach/Hillsboro	Pompano - Unincc. Laud. by the Sea	Fort Lauderdale	J.U. Lloyd	Dania	Hollywood/ Hallandale
Structural Protection Measures						
Revetment						
Beach fill and periodic nourishment	A	A,C,M	A,M	A,C	A,M	A,C,M
Maintenance nourishment from updrift inlet						
Seawalls						
Surge protection sand dune						
Nearshore berms	PL	PL		PL,M		US
Stabilize beach and dunes with vegetation						
Feeder beach						
Relocate structures						
Flood proof structures						
Abandon/modify navigation project						
Sand tighten jetty						
Sand trap						
Upgrade/construct sand transfer plant						
Non-Structural Protection Measures						
Rezoning beach area						
Modify building codes						
Construction Setback						
Construction moratorium						
Flood insurance						
No growth program						
Condemnation of land and structures						

NOTES: A = Authorized and not constructed; C = Constructed; PL = Planned; US = Under Study; M = Modification

Source: USACE, 1996, *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III*, Jacksonville District: Jacksonville, Florida.

Table 2.3. Presently Proposed Combination of Alternatives: Dade County

Category	Golden Beach	Sunny Isles	Bal Harbor - Surfside, Miami Beach	Key Biscayne
Structural Protection Measures				
Revetment				
Beach fill and periodic nourishment	PL,M	A,C,M	A,C	A,C
Maintenance nourishment from updrift				
Seawalls				
Surge protection sand dune				
Nearshore berms	US	US	PL,M	
Stabilize beach and dunes with vegetation				
Feeder beach				
Relocate structures				
Flood proof structures				
Abandon/modify navigation project				
Sand tighten jetty				
Sand trap				
Upgrade/construct sand transfer plant				
Non-Structural Protection Measures				
Rezoning beach area				
Modify building codes				
Construction Setback				
Construction moratorium				
Flood insurance				
No growth program				
Condemnation of land and structures				

NOTES: A = Authorized and not constructed; C = Constructed; PL = Planned; US = Under Study; M = Modification

Source: USACE, 1996, *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III*, Jacksonville District: Jacksonville, Florida.

2.4.1.3 Lake Worth Inlet to South Lake Worth Inlet Project Segment.

Recommend that the project for Palm Beach County, Florida for Lake Worth Inlet to South Lake Worth Inlet (Palm Beach Island) authorized in 1958 (PL 85-500) be deauthorized. The following project components for Palm Beach Island would be added as project modifications to the Palm Beach County, Florida (1962) project. Extension of Federal participation from 10 years to the economic life of the project is also recommended for each project component.

2.4.1.3.1 Lake Worth Inlet. The recommended plan for Lake Worth Inlet requires the construction of a new fixed sand transfer plant to be located north of the inlet with three discharge points located along the dry beach 750, 1,250, and 1,750 feet south of the south jetty on Palm Beach Island. This system would be designed for a target bypassing rate of about 160,000 cubic yards per year to the south, across the inlet, through a 12-in pipeline.

2.4.1.3.2 The recommended plan for the sand bypassing plant would include:

a. A deposition area north of the north jetty,

b. An array of jet pumps suspended from a pier oriented perpendicular to the shoreline, or a single jet pump deployed by a crane from the north jetty,

c. A clear water pump and pipeline providing water to the jet pumps,

d. An on shore pumphouse containing the clear water pump and a booster pump for transferring the dredged material past the inlet,

e. A slurry pit to ensure the proper ratio of solids to water,

f. An drilled tunneled pipeline under the inlet from north of the north jetty to the south side of the south jetty, and

g. All associated pipe, valves, instruments, and controls required for operation of the system, including three remote controlled discharge valves located within the first 2,250 feet south of the south jetty.

The detailed sand transfer plant design would be determined within a Feature Design Memorandum (FDM) to be prepared during preconstruction, engineering, and design (PED).

2.4.1.3.3 North-End Palm Beach Island. The 1.95 mile beach restoration and periodic nourishment project component located between DEP monuments R-76 and R-85 is authorized (1958), but not constructed. The optimal berm width is 10 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 100,000 cubic yards with a 190 foot toe of fill. The recommended renourishment interval is four years. Approximately 2.3 acres of new beach would be created under this alternative. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 281 feet with a total volume of 239,400 cubic yards. Mitigation for approximately 18 acres of hardground impact may be necessary in association with this project segment. Nearshore berms are not feasible in association with this project component due to the presence of nearshore hardgrounds.

2.4.1.3.4 Palm Beach Island (Mid-town). The 3.1 mile beach restoration and periodic nourishment project component located between DEP monuments R-91 and R-105 is authorized (1958), but not constructed. The optimal berm width is 25 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 568,400 cubic yards with a 390 foot toe of fill. The recommended renourishment interval is four years. Approximately 9.3 acres of new beach would be created under this alternative. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment is 455 feet with a total volume of 1,025,7800 cubic yards. Mitigation for approximately 3.65 acres of hardground impact may be necessary in association with this project component. Three potential nearshore berm sites have been identified for use as an alternative maintenance dredged material disposal site for the Federal navigation project at Palm Beach Harbor.

2.4.1.3.5 South-End Palm Beach Island. This 3.25 mile beach restoration and periodic nourishment project component located between DEP monuments R-116 and R-132 is authorized (1958), but not constructed. The optimal berm width is 35 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 248,900 cubic yards with a 350 foot toe of fill. The recommended renourishment interval is four years. Approximately 13.8 acres of new beach would be created under this alternative. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 432 feet with a total volume of 674,500 cubic yards. Mitigation for approximately 5.4 acres of hardground may be necessary in association with this project component.

2.4.1.4 South Lake Worth Inlet to Boca Raton Inlet Segment:

2.4.1.4.1 South Lake Worth Inlet. The recommended plan for South Lake Worth Inlet requires the construction, operation and maintenance of a new sand transfer plant to be located north of the inlet with one discharge point located approximately 2,000 feet south of the south jetty. This system would be designed for a target bypassing rate of about 120,000 cubic yards per year. The design would be similar to the Lake Worth Inlet sand transfer plant and would similarly be determined within a FDM during PED studies.

2.4.1.4.2 Ocean Ridge. The 1.35 mile beach restoration and periodic nourishment project component located between DEP monuments R-152 and R-159 is authorized (1962), but not constructed. This project is scheduled for construction by Palm Beach County during 1996. The optimal berm width is 60 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 770,000 cubic yards and includes 8 years of advance nourishment. The annual advance nourishment is 62,600 cubic yards. Two nearshore berm sites, however, have been recommended as potential dredged material disposal sites. Extension of Federal participation from 10 years to 50 years is recommended.

2.4.1.4.3 Delray Beach. The recommended 2.7 mile beach restoration and periodic nourishment project component located between DEP monuments R-175 and R-188 is authorized and constructed. This project is recommended for modification with an additional 20 feet optimal berm width at elevation +9.0 feet NGVD and slopes of 1:20 berm to MLW and 1:30 from MLW to existing bottom. The recommended additional design volume is 155,300 cubic yards with a 290 foot equilibrium toe of fill. Approximately 6.5 acres of new beach would be created under this alternative. No hardgrounds exist in the vicinity of this project so no mitigation will be required. Although this project component is a considerable distance from either inlet, an extensive nearshore berm site offshore of this project component is recommended as a potential dredged material disposal site. Extension to 50 years of Federal participation was approved by Assistant Secretary of Army (Civil Works) under Section 934.

2.4.1.4.4 Highland Beach. The 3.4 mile beach restoration and periodic nourishment project component located between DEP monuments R-188 and R-205 is a modification to the authorized (1962) periodic nourishment project. It would fill in a gap between two authorized projects for lessening end losses. The optimal berm width of this project component is 120 feet at elevation +9.0 feet NGVD, and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 944,999 cubic yards with a 350 foot toe of fill. The recommended renourishment interval is seven years. Approximately 49.5 acres of new beach would be created under this alternative. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 450 feet with a total volume of 1,765,287 cubic yards. Mitigation for approximately 1.9 acres of hardground impact may be necessary in association with this project component. One nearshore berm site has been identified offshore of this project coastline. Extension of Federal participation from 10 years to 50 years is recommended.

2.4.1.4.5 Boca Raton. The 1.65 mile beach restoration and periodic nourishment project component located between DEP monuments R-205 and R-213 is authorized and constructed. The only recommended modification to this project segment is a nearshore berm site as an alternative maintenance dredged material disposal site. The Boca Raton project has been extended to 50 years of Federal participation by Assistant Secretary of Army (Civil Works) under Section 934.

2.4.1.5 Other Palm Beach County Project Segment Alternatives.

As previously discussed, specific recommendations for the 1.9 miles of northern the Palm Beach County shoreline, north of Jupiter Inlet, will be addressed in the Region IV COFS study. In addition to the above specific project segments, periodic nourishment as necessary and justified is an existing project feature for Palm Beach County, Florida. No modification of this project feature is recommended for the economic life of the project. Dune grassing, as necessary and justified is also recommended for the Palm Beach County shoreline as a cost effective project feature.

2.4.2 Broward County

2.4.2.1 Boca Raton Inlet (Palm Beach County) to Hillsboro Inlet (Broward County) Segment.

2.4.2.1.1 Deerfield Beach/Hillsboro Beach (Segment I). The 4.4 mile beach restoration and periodic nourishment project segment located between DEP monuments R-1 and

R-24 is authorized, but not constructed. The optimal berm width is 30 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 746,700 cubic yards with a 300 foot toe of fill. The recommended renourishment interval is seven years. Approximately 16.0 acres of new beach would be created under this alternative. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 406 feet with a total volume of 1,055,820 cubic yards. Mitigation for approximately 4.65 acres of hardground may be necessary in association with this project segment. A nearshore berm dredged material disposal site has been identified and recommended offshore this project shoreline. It is also recommended that Federal participation in this project segment be extended from 10 years to the economic life of the project.

2.4.2.1.2 Hillsboro Inlet. Navigation improvements are being considered for the outer channel at this inlet to provide additional advanced maintenance for the entrance channel as part of the Hillsboro Inlet, Florida, Federal navigation project. Two alternatives are being evaluated. One alternative is as designed and contained within a permit request by the local sponsor. The other is an alternative designed by Jacksonville District. The recommendations for this navigation project will be addressed in a separate navigation report which will address related potential impacts to the adjacent shorelines.

2.4.2.2 Hillsboro Inlet to Port Everglades Inlet Segment (Segment II).

2.4.2.2.1 Pompano/Lauderdale-By-The-Sea. The 5.2 mile beach restoration and periodic nourishment project segment located between DEP monuments R-24 and R-53 is authorized and constructed. This project is recommended for modification with an additional 35 feet optimal berm width at elevation +9.0 feet NGVD and slopes of 1:20 berm to MLW and 1:30 from MLW to existing bottom. The recommended additional design volume is 600,000 cubic yards with a resulting equilibrium toe of fill of 365 feet. Approximately 22.0 acres of new beach would be created under this alternative. Mitigation for approximately 12.25 acres of hardground may be necessary in association with this project segment modification. A nearshore berm dredged material disposal site has been identified and recommended off this project shoreline. Extension of Federal participation in this project segment from 10 years to the economic life of the project is also recommended.

2.4.2.2.2 Fort Lauderdale. This 4.0 mile project segment area located between DEP monuments R-53 to R-74 is authorized for periodic nourishment. A beach restoration and periodic nourishment project segment modification is recommended. The recommended optimal berm width is 25 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 437,024 cubic yards. The recommended renourishment interval is six years. Approximately 12.1 acres of new beach would be created under this alternative. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 500 foot with a total volume of 792,108 cubic yards. Federal participation to the 50 year economic life of this project segment is recommended. Mitigation for approximately 8.0 acres of hardground impact may be necessary in association with this project segment. Nearshore berms are not feasible in association with this project segment due to the presence of nearshore hardgrounds.

2.4.2.3 Port Everglades Inlet (Broward County) to Bakers Haulover Inlet (Dade County).

2.4.2.3.1 Broward County (Segment III). Segment III of the Broward County project includes two authorized beach restoration and periodic nourishment project sections, J.U. Lloyd and Hollywood/Hallandale. Extension of Federal participation to the 50 year economic life of these projects was approved by Assistant Secretary of Army (Civil Works) under Section 934 in September 1992.

2.4.2.3.2 J.U. Lloyd. The 2.3 mile beach restoration and periodic nourishment project segment located between DEP monuments R-86 and R-98 is authorized and constructed. The optimal berm width in the reanalysis of this project remains at 100 feet at elevation +10 feet NGVD and slopes of 1:15 berm to MLW and 1:30 from MLW to existing bottom. The design volume, including initial fill and advance nourishment is 1,032,000 cubic yards. The renourishment interval is six years. The only recommended modification to this project segment is a nearshore berm site as an alternative maintenance dredged material disposal site.

2.4.2.3.3 Hollywood/Hallandale. The 5.25 mile beach fill project located between DEP monuments R-101 and R-128 is authorized and constructed. This project is recommended for modification with an additional 50 feet optimal berm width at elevation +7.0 feet NGVD and slopes of 1:15 berm to MLW and 1:40 from MLW to existing bottom. The recommended additional design volume is 720,000 cubic yards resulting in a project equilibrium toe of fill of 230 feet. The renourishment interval is six years. Approximately 31.8 acres of new beach would be created under this alternative. No hardgrounds exist in the immediate vicinity of this project so no mitigation will be required. A nearshore berm dredged material disposal site has been identified offshore of this project segment.

2.4.2.3.4 Dania. This 0.6 mile reach of beach is presently authorized for periodic nourishment. A modification to a beach restoration and periodic nourishment project is recommended for this project segment component located between DEP monuments R-98 and R-101. Initial restoration of the beach at Dania would fill in the gap between J.U. Lloyd and Hollywood/Hallandale. Due to the small project length, the fill would be designed as a transition between these two all ready constructed projects and help reduce end losses in Segment III. The optimal berm width transition between J.U. Lloyd and Hollywood/Hallandale is 125 feet, on the average (i.e., between 100 and 150 feet), with a transition berm height between elevation +10.0 feet and +7.0 NGVD and slopes of 1:15 berm to MLW and 1:40 from MLW to existing bottom. The initial design volume is 208,300 cubic yards. The recommended renourishment interval is six years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 220 feet with a total volume of 460,840 cubic yards. Approximately 9.1 acres of new beach would be created. Federal participation in the economic life of this transition project component is recommended.

2.4.2.3.5 Other Broward County Project Segments. In addition to the above specific project segments, periodic nourishment as necessary and justified is an existing project feature to the Broward County, Florida project. No change in this project feature is recommended at this time. Dune grassing, as necessary and justified is also recommended for the Broward County shoreline as a cost effective project feature.

2.4.3 Dade County

2.4.3.1 Golden Beach.

It is recommended that the Dade County, Florida, Beach Erosion Control and Hurricane Protection Project be modified to include initial restoration and periodic nourishment for the 1.2 mile shoreline located between DEP monuments R-1 and R-7 in Dade County. This project component would fill in a gap between the Dade County and Broward County authorized projects, decreasing project end losses. The optimal berm width in the analysis of this project component is 100 feet at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 311,000 cubic yards with a 260 foot toe of fill. The recommended renourishment interval is six years. Approximately 14.5 acres of new beach would be created under this alternative. The distance to the recommended equilibrium toe of fill, including initial fill plus advance nourishment is 832 feet with a total volume of 534,660 cubic yards. Mitigation for approximately 5.25 acres of nearshore hardground impact may be necessary in association with this project segment. One nearshore berm site has been identified as an alternative maintenance dredged material disposal site.

2.4.3.2 Sunny Isles.

The 2.65 mile beach fill project segment component located between DEP monuments R-7 and R-20 is authorized and constructed. This segment of the Dade County, Florida project is recommended for modification with an additional 20 feet optimal berm width at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The recommended additional design volume is 146,700 cubic yards with an additional 200 foot toe of fill extension. Approximately 6.4 acres of new beach would be created under this alternative. No hardgrounds exist in the vicinity of this project so no mitigation will be required. One nearshore berm site has been identified as an alternative maintenance dredged material disposal site.

2.4.3.3 Bakers Haulover Inlet to Government Cut.

2.4.3.3.1 Bal Harbor, Surfside, Miami Beach. The 9.3 mile beach fill project segment located between DEP monuments R-27 and R-74 is authorized and constructed. The only recommended modifications to this project segment are the addition of four nearshore berm sites that have been identified as an alternative maintenance dredged material disposal sites.

2.4.3.3.2 Government Cut. As identified in a previous design memorandum, a sand tightening of Government Cut has been recommended. This sand tightening will help reduce end losses to the southern portion of the Miami Beach project segment and further reduce Government Cut maintenance dredging requirements. The sand tightening project will be undertaken as a separate project modification.

2.4.3.4 Project Segments South of Government Cut.

2.4.3.4.1 Virginia Key/Northern Key Biscayne. Shore protection of Virginia Key and northern Key Biscayne was authorized by the River and Harbor Act of 1962

(PL 87-874). Construction of the 1.8 mile Virginia Key shoreline and 1.9 mile northern Key Biscayne shoreline was completed in 1969. The Virginia Key shoreline was renourished in 1972 and 13 groins were also constructed. This project was deauthorized in 1990. As documented in the 1992 Rehabilitation Report following Hurricane Andrew, in August 1992, the Virginia Key project was found to be performing well to date. No project segment modification is recommended for Virginia Key at this time.

2.4.3.4.2 Key Biscayne. The 2.3 mile beach fill project located between DEP monuments R-101 and R-113 was initially constructed in 1985 under the authority of Section 103 of the 1962 River and Harbor Act. Nourishment for 50 years was authorized, however, the Federal limit of $1,000,000 under Section 103 has been met. It is recommended that the Dade County project be modified to incorporate this project segment so that Federal participation in periodic nourishment can be continued through the economic life of this project segment. An additional optimal berm width of 10 feet at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom is recommended. The additional project design volume is 106,660 cubic yards. The recommended renourishment interval is seven years. Approximately 2.8 acres of new beach would be created under this alternative.

2.4.3.5 Other Dade County Project Segments.

In addition to the above specific project segment modifications, periodic nourishment as necessary and justified is recommended for all Atlantic Ocean shorelines within Dade County for the economic life of each project segment. Dune grassing, as necessary and justified is also recommended for the Dade County shoreline as a cost effective project feature.

2.5 Comparative Impact of Alternatives

Impacts projected under the proposed action and the no-action alternatives are displayed in the following presentation matrix, Table 2.4. Details on impacts and mitigation can be found in the corresponding sections of the report.

2.6 Mitigation Summary and Plan

Table 2.4 displays projected mitigation needs for the implementation of the recommended plan. Under the recommended plan, ameliorative and mitigative measures would be required for: (1) impacts to sea turtles associated with nourishment activities; (2) impacts to sea turtles, manatees, and right whales associated with dredge operations; (3) impacts to seagrass patches associated with both the borrow operations and nourishment operations; (4) impacts to hardgrounds buried or damaged by increased sedimentation or turbidity in association with nourishment operations; and (5) impacts to hardgrounds damaged by increased sedimentation, turbidity, or mechanical damage at borrow sites. Details of mitigation measures can be found in the associated mitigation section by resource; however, no project-specific details are discussed in this report. Project-specific mitigation details and plans will be developed as project details become available and will be included in tiered documentation at a latter date.

Table 2.4 Comparative Impact of Alternatives

Significant Resources	No-Action Impacts	Net Impacts of Proposed Combination of Alternatives (Recommended Plan)	Mitigation for Proposed Combination of Alternatives (Recommended Plan)
Physical Setting	Aesthetic impacts associated with unabated beach erosion; landward advancement of surf zone.	Temporary aesthetic impacts associated with construction activities; insignificant changes in wave climate associated with borrow operations. Exhaust emissions from construction activities would add temporary and insignificant levels of pollutant to the local air sheds.	None.
Geology/Hydrology	Assumed no turbidity impacts to water quality; continual but insignificant occurrences of saltwater intrusion.	Temporary increases in turbidity adjacent to both the borrow sites and the nourishment zones, with lower turbidity associated with hopper dredging; permanent increases in turbidity in zones adjacent to the sand transfer outlets. Use of Bahamian sand would change beach color, density, and texture but have no significant impacts to either Bahamian borrow areas of potential nourishment areas in Broward and Dade counties; potential for fuel or other effluent spills from dredge-associated equipment.	None.
Endangered Species	Sea turtle nesting areas would continue to decrease in area as beaches erode; continual erosion into the dune areas during storm events may threaten endangered dune species.	Sea turtle nesting areas would increase in area with nourishment activities (100 additional acres in Palm Beach County, 91 additional acres in Broward County, and 24 additional acres in Dade County); potential for incidental "takes" of sea turtles from sand deposition, over-compaction of nourished beaches, unnatural escarpments, and equipment lighting, and dredge operations; use of Bahamian sand for nourishment activities may affect the gender of hatchlings; likely encounters with the West Indian Manatee with support boats for dredge operations; possible but insignificant impacts to endangered dune species from increased tourism associated with beach nourishment; possible but unknown impact to Johnson's seagrass from borrow operations; possible but unlikely encounters with the right whale from dredge operations.	Although project-specific mitigation plans will be developed at a later date in tiered documentation, general mitigation actions are discussed herein. Nourishment Areas: Activities would be conducted outside peak sea turtle nesting season and totally outside of the nesting season in some areas of high density nesting; 65 day pre-construction nest survey and relocation conducted between sunrise and 10:00 A.M.; nourished beaches would be monitored for the 500 CPU and tilled to 36 inches; escarpments greater than 18 inches and 100 feet long would be leveled; lighting on equipment would be screened/shielded and otherwise minimized and restricted to low-pressure sodium lights. Borrow Areas/Dredging: Should hopper dredging be utilized, a rigid draghead deflector would be used, inflow and outflow screening would be required, shipboard observers for both sea turtle and whale identification would be required, and the policy of dredge pumps remaining disengaged when dragheads are not firmly on bottom would be observed. Generally, with all dredge operations, whale observers would be used, as appropriate, signs would be posted on crew vessels and work stations informing the crew of possible whale and manatee encounters; no-wake speeds would be observed at all times in shallow waters; and logs of encounters for all species would be kept for the USFWS or NMFS. In areas where Johnson's seagrass may be impacted by dredging operations consultation with NMFS would occur on a case-by-case basis.
Sea Grass Beds	No effects anticipated.	Potential for burial, sedimentation, and turbidity impacts from nourishment activities to seagrass beds located adjacent to Key Biscayne; potential for temporary and insignificant impacts associated with lower light penetration caused by increased turbidity from borrow operations.	Although project-specific mitigation plans will be developed at a later date in tiered documentation, general mitigation actions are discussed herein. Should the burial or destruction of seagrass patches be unavoidable, consultation with the USFWS and NMFS should be completed to determine an appropriate mitigation plan. Should transplanting be involved in the mitigation plan, it should be completed in accordance to Fonseca (1993) unless otherwise specified.

Table 2.4 (cont'd) Comparative Impact of Alternatives

Significant Resources	No-Action Impacts	Net Impacts of Proposed Combination of Alternatives (Recommended Plan)	Mitigation for Proposed Combination of Alternatives (Recommended Plan)
Hardgrounds	Additional nearshore hardgrounds would become exposed.	Burial of approximately 31 acres of nearshore hardgrounds in Palm Beach County, 25 acres of nearshore hardgrounds in Broward County, and 5 acres of nearshore hardgrounds in Dade County; potential for mechanical damage to hardgrounds adjacent to borrow operations, with higher probability associated with hopper dredges. Potential for temporary turbidity and sedimentation impacts around borrow operations.	Although project-specific mitigation plans will be developed at a later date in tiered documentation, general mitigation actions are discussed herein. Mitigation will probably be conducted post-project (no sooner than one year and within two years of project completion) due to the complexities of predicting hardground impacts and to allow the beach to come to equilibrium. Estimates of hardground impacts would be time-averaged to determine actual permanent impact; mitigation of hardgrounds will be accomplished with either limestone boulders, artificial reef modules of concrete and limestone, or concrete rip-rap. Specifics of mitigation plans (type, location, and ratio of mitigation) will be prepared as project details become available and will be included in tiered documentation.
Softgrounds	No effects anticipated.	Likely major but temporary and naturally recoverable infaunal diversity changes in some nearshore and offshore softbottom areas associated with borrow operations. Effects of borrow operations in Bahamian sand areas is inconclusive but likely similar to that expected in borrow areas in waters off Florida's coast.	None.
Inlet Communities	No effects anticipated.	Although maintenance dredging would occur in all inlets, sand transfer plants would only be constructed on the Lake Worth and South Lake Worth Inlets. Motile species inhabiting these inlet areas that are sensitive to this perturbation would relocate to other areas during construction activities and not be significantly affected. Turbidity, sedimentation, and lower light penetration impacts to hardground communities and sea grass beds would likely be minor because of low silt content of material in this area.	None.
Dune Communities	Continual landward migration of surf zone may threaten dunes during storm events.	Approximately 100, 91, and 24 acres of new beach would be created in Palm Beach, Broward and Dade counties, respectively; increased density of some existing grass species should be realized with dune-grassing activities in areas for which this is planned. Increased shore width would better protect dunes and their communities during storm activities.	None.
Migratory Birds	No anticipated effects.	Migratory birds may be temporarily discouraged from using areas during construction activities and would relocate to other areas away from anthropogenic activity.	None.
Socioeconomic Resources	Approximately $33 million in storm damages associated with 10 to 20 year storm could be experienced in Region III; decline of commerce associated with beach tourism; potentially small increases in diving opportunities associated with increased hardground exposure.	Short-term employment effects for regional labor would have direct and indirect benefits on the local economies. Approximately $33 million storm damages associated with the 10 to 20 year storm would be avoided in Region III with the implementation of the recommended plan.	None.
Cultural Resources	No anticipated effects.	Potential disturbance of undocumented submerged archaeological sites.	Although project-specific mitigation plans will be developed at a later date in tiered documentation, general mitigation actions are discussed herein. Consultation with SHPO upon any positive magnetometer surveys at offshore borrow areas and sand bypass systems at inlets. Significant magnetometer anomalies will be avoided with the use of buffer zones or investigated by archaeological divers prior to disturbance should the sites be unavoidable.

Table 2.4 (cont'd) Comparative Impact of Alternatives

Significant Resources	No-Action Impacts	Net Impacts of Proposed Combination of Alternatives (Recommended Plan)	Mitigation for Proposed Combination of Alternatives (Recommended Plan)
Recreational Resources	Continued shoreline recession with corresponding decreases of beach area; likely increases of hardground diving areas in nearshore environment.	Estimated 100, 91, and 24 acres of new beach would be created in Palm Beach, Broward, and Dade counties, respectively; temporary aesthetic impact of nourishment activities, equipment, and crews would deter beach activities in the areas during construction. Temporary increases in turbidity may degrade snorkeling and diving experiences around borrow and nourishment areas.	None.
Other Considerations	Energy requirements associated with clean-up after storm events would continue to increase concurrent with realized damages.	Two parcels near Dania Beach are listed as undeveloped coastal barriers as defined by the Coastal Barriers Resources Act, which require coordination with USFWS prior to nourishment activities. Insignificant energy requirements for construction and for the permanent operation of the sand transfer plant would also be required.	Coordination with USFWS must be accomplished for any nourishment activities on the two parcel listed on the Coastal Barrier Resources System.

Note: Mitigation refers to actions required to ameliorate potential impacts and mitigate absolute impacts caused by the implementation of the recommended plan of COPS.

3.0 AFFECTED ENVIRONMENT

3.1 Physical Setting

3.1.1 Climate

There are two U.S. Weather Bureau offices within Region III, which are located at the West Palm Beach and Miami airports. The National Oceanic and Atmospheric Administration provides a Local Climatic Annual Summary with Comparative Data for each location. Wind data for each location is discussed in the following paragraphs. Although completely within the temperate zone, southeastern Florida has generally a subtropical climate due to the proximity of the Florida current or Gulf Stream. Annual precipitation averages approximately 60 inches per year in West Palm Beach and 55 inches per year in Miami. The mean daily maximum temperature in West Palm Beach and Miami is approximately 82° Fahrenheit (F). The mean daily minimum temperature is slightly cooler in West Palm Beach at 67°F, 2°F cooler than Miami.

3.1.2 Storm Events

The shoreline of the study area is open to wave attack from the north-northeast through east to the southeast. Normally, the wave climate from these directions is modest in intensity. However, the preponderance of beach erosion and generally all of the storms emanating from the northeast direction are from cyclonic disturbances. The major threats to the stability of the shoreline in the study area are surges and waves caused by tropical storms (including hurricanes) and northeasters. Since 1960, Palm Beach and Broward counties have had three hurricanes and three tropical storms each, and Dade County has had three hurricanes and two tropical storms. For a detailed discussion of tropical and northeaster storm development and of past storm activity, see the *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996,* USACE, Jacksonville District.

3.1.3 Winds

Local winds are the primary generating mechanism of the short-period waves experienced in the project area. These winds vary in direction, intensity, duration, and seasonality. There are marked differences between winter and summer wind conditions in the study area.

Prevailing, or most common, winds are from the northeast through the southeast and average 9.7 and 9.3 mph for West Palm Beach and Miami, respectively. During the fall and winter months, winds are often out of the northwest through the northeast as a result of cold fronts with their associated areas of low pressure, which generally traverse the continental U.S. from west to east. The summer months are characterized by tropical weather systems traveling east to west in the lower latitudes. The fastest wind speed of 86 mph observed for one minute and the peak gust of 115 mph for Miami, Florida, both occurred during Hurricane Andrew in August 1992. These values represent wind speeds experienced during Hurricane Andrew. For a detailed discussion of winds in Region III, see the *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996,* USACE, Jacksonville District.

3.1.4 Waves

The principle cause of beach erosion is the action of waves that break on a beach, resulting in sediment transport. Waves cause littoral movement in the longshore direction as well as the onshore-offshore direction. Due to the general north-south bearing of the Region III coastline, waves approaching from the north and northeast cause a southerly sand movement, and waves from the south and southeast cause a northerly movement. Waves from the east create very little alongshore sand movement. The east coast of Florida experiences seasonal reversals in the direction of littoral drift (south in winter and north in summer) due to seasonal changes in wind and, thus, wave direction.

The waves that occur in the vicinity of the study area consist of "sea" and "swell." Local seas are the product of local winds associated with both mild and severe weather events and are dependent on wind speed, fetch, and water depth. These parameters also dictate the wave height and period that will be generated. Seas are generally quite steep (having a large wave height to wavelength ratio) and can be random due to superposition of waves from a number of different directions.

Swells, unlike seas, are comprised of waves that have been generated from distant storms or open ocean prevailing winds and are no longer under the influence of local winds. These waves generally have longer periods, and thus longer wavelengths, than wind waves. Northeasters and hurricanes often generate swells that impact the coast of south Florida. The Little Bahama Bank to the northeast and east, the Great Bahama Bank to the southeast and east and the island of Cuba to the south complicate the interpretation of swell data in Region III. The fetch to the east is limited to about 60 miles by the presence of the Bahama banks, decreasing the chance of receiving major swells. The main directions of approaching swells along this part of the coast are from the northeast and southeast. Large waves produced over a long fetch by storms in the north Atlantic can reach the project area even though this approach window is quite narrow. In contrast, the fetch to the south and southeast is limited to about 200 miles, resulting in smaller waves for similar wave generating parameters. Therefore, the predominant wave energy sources in the study area are wind- generated waves or local seas. For a detailed discussion of wave action in Region III, see the *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996,* USACE, Jacksonville District.

3.1.5 Currents

The dominant currents in the study area are the Florida Current (the portion of the Gulf Stream flowing through the Florida Straits), longshore current, and tidal currents through inlets. The most significant is the Florida current of the Florida Gulf Stream, which flows approximately one mile offshore, along most of Region III's coastline. With the exception of intermittent local reversals, its flow is northward between 17 and 37 miles per day. Longshore currents are generally southward in the winter and northward in the summer. Velocities as high as 7.5 feet per second have been recorded for longshore currents in Region III (Lake Worth Pier), but typically, currents are approximately 1.0 foot per second (*Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996,* USACE, Jacksonville District). Tidal flood currents (landward) and ebb currents (seaward) also affect the morphology of the coast. Peak tidal current velocities of 6.0 feet per second have been documented at South Lake Worth Inlet, with Government Cut Inlet having a slightly lower average tidal peak velocity of approximately 5.5 feet per second. For a more detailed discussion of currents in Region III, see the *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996*, USACE, Jacksonville District.

3.1.6 Tides

Tides are important factors in littoral processes. The tide level influences the water depth, which dictates the point at which a wave approaching shore will break. The tide level gradient and phase also directly affects current speeds within inlets. Astronomical and storm tides are the two basic tide types that occur in the ocean near the study area. Theoretical astronomical tides in the study area are predictable; however, non-astronomical tides and the still-water levels or storm tides (storm surges) caused by extremely high wind velocities coupled with very low barometric pressures (during tropical depressions and storms or hurricane conditions) are not predictable. Astronomical tides in the study area are semidiurnal; that is, there are two high and two low waters each lunar day (24.84 hours). Highest tides occur at spring tide (full moon and new moon) conditions and in association with storms as a combination of wind setup, barometric pressure setup, and normal peak tides. Extremely high wind velocities coupled with very low barometric pressures during tropical depressions and storms or hurricane conditions have caused tides as high as 10.6 feet above MLW on the south Dade County shoreline. For a detailed discussion of tides in Region III, see *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996*, USACE, Jacksonville District.

3.1.7 Storm Surge

The rise of the ocean surface above its normal high-tide level during a storm is referred to as the storm surge, or still-water, elevation. With a higher still-water level (surge), larger waves can reach the shoreline, accelerating erosion. The increased water level elevation is due to a variety of factors, including waves, wind shear stress, and atmospheric pressure. An estimate of water level change is essential for the design of shore protection projects since an increase in water level will allow larger breakers to attack the shoreline at higher elevations above mean sea level.

The storm surge along the Key Biscayne ocean shoreline caused by Hurricane Andrew in August 1992 was reported to be 10.1 and 10.6 feet above MLW along the northern and southern ends of Key Biscayne, respectively. Key Biscayne was completely inundated during Andrew. These storm surges, which undoubtedly included wave runup, were obtained by the measurement of high-water marks on structures along the shoreline by the Coastal Engineering Research Center (CERC), the Florida Department of Natural Resources (FDNR), and the U.S. Geological Survey (USGS). The highest elevation of the sea surface measured in Palm Beach County was 11.2 feet, which occurred during the hurricane of September 1928.

The Federal Emergency Management Agency (FEMA) has performed investigations to determine hurricane surge elevation in the Flood Insurance Studies (FIS) for Palm Beach, Broward, and Dade counties. The maximum calculated wave heights for the 100-year still water elevation at the Region III Atlantic Ocean shoreline in Palm Beach, Broward, and Dade counties are 11 feet, 12 feet, and 14 feet, respectively.

3.1.8 Sea Level Rise

Eustatic sea level change is defined as a global change of oceanic water level. Total relative sea level change is the difference between the eustatic sea level and any change in local land elevation. Throughout geologic history, global sea level variations, both rise and fall, have occurred. Some authorities have found evidence to indicate that we may be entering a new ice age with a resultant sea level drop. Others argue that increasing atmospheric concentrations of carbon dioxide and other gases are causing the earth to warm, contributing to a sea level rise. Both global cooling or warming thus contribute to absolute global sea level change.

There has been a steady decline in the predicted rise in sea level from two meters in 1983 to 0.5 meters in 1990. The uncertainty in each estimate initially declined as scientists thought they increasingly understood the relationship between global warming and sea level rise. However, the uncertainty of the most recent NRC estimate in 1990 is greater than any since the original 1983 EPA study. The 1990 NRC estimate predicts a 0.5-meter rise in sea level by the year 2100 with an error of plus or minus one meter. The lower limit of this NRC prediction is a sea level fall of 0.5 meters (Houston, 1993). For a detailed discussion of eustatic and local sea level rise in Region III, see the *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996,* USACE, Jacksonville District.

3.1.9 Air Quality and Noise

Ambient air quality in the three counties is generally good because of prevalent ocean breezes from the northeast through the southeast. Palm Beach, Broward, and Dade counties are in attainment with the Florida State Air Quality Implementation Plan for all parameters but ozone. For ozone, the three counties are in moderate non-attainment.

Ambient noise around the project area is typical to that experienced in recreational environments and ranges from low to moderate based on the density of development and recreational usage. Major noise producers include breaking surf, beach and nearshore water activities, adjacent commercial and residential areas, and boat and vehicular traffic.

3.2 Geology

3.2.1 Geology and Geomorphology of Study Area

The Florida Plateau, occupied by present-day Peninsular Florida, had its origins during the Mesozoic Era, some 200 million years before the present. The plateau has been alternately dry land or covered by shallow seas since that time, with an accumulation of 4,000 to 20,000 feet of carbonate and marine sediments over that period. During the Pleistocene Epoch, Florida experienced four periods of inundation and emergence, and this resulted in the deposition of four surficial Pleistocene formations: the Miami (youngest), Key Largo, Anastasia, and Fort Thompson (oldest). During the last glacial retreat (Wisconsin glaciation) a thin sheet of quartzose sand, the Pamlico Sand, was deposited over the Miami and Anastasia formations. The present day barrier islands of southeast Florida were formed during the Holocene (Recent) Epoch, within the last 7,000 to 6,000 years. The sand comprising the modern barrier islands of Region III is partially quartz sand that has migrated southward along the coast from rivers and the coast north of Region III and from the reworking of Pamlico Sand that blankets the region.

In Palm Beach County, the barrier islands are founded on the Anastasia Formation, and in Broward and Dade counties the barrier islands are founded on the Miami Limestone. For a detailed discussion of regional and area geology, see the *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996,* USACE, Jacksonville District.

3.2.2 Water Quality

Groundwater, the major source of potable water in Region III, is supplied by two major aquifers: the Biscayne or surficial aquifer and the Floridan aquifer. The Biscayne or surficial aquifer is an unconfined sand and shell aquifer extending from 30 feet deep in the western reaches of Region III to between 300 and 400 feet deep at the coast. The Floridan aquifer lies between 700 and 1,100 feet deep and is confined by an approximately 400-foot layer of marine clay. Because of salinity and the cost of reverse osmosis treatment, this aquifer is generally not used for potable uses; however, potable use is increasing as Biscayne or surficial reserves become optimized. Water quality in the Biscayne or surficial aquifer is generally good, but salinity is a problem in transition areas along the margin of the freshwater/saltwater interface. Saltwater intrusion from canal construction and heavy withdrawals has been an historic problem with groundwater salinity in Region III, but with the advent of salinity control structures and water management policies, salinity has decreased in most areas of concern. Salinity is largely controlled by recharge precipitation. Connate water, or relic seawater, is also a problem in the inland wells. Connate water encounters are more likely the further west and the deeper the withdrawals in Region III.

Waters off the coast of Palm Beach, Broward, and Dade counties are classified as Class III waters by the State of Florida. Class III category waters are suitable for recreation and the propagation of fish and wildlife. Turbidity is the major limiting factor in coastal water quality in Region III. Turbidity is measured in Nephelometric Turbidity Units (NTU), which quantitatively measure light-scattering characteristics of the water. However, this measurement does not address the characteristics of the suspended material that creates turbid conditions. According to Dompe and Haynes (1993), the two major sources of turbidity in coastal areas are very fine organic particulate matter and sediments and sand-sized sediments that become resuspended around the seabed from local waves and currents. Florida state guidelines set to minimize turbidity impacts from beach restoration activities confine turbidity values to under 29 NTU above ambient levels outside the turbidity mixing zone for Class III waters.

Ambient turbidity data for Region III coastal waters are largely non-existent except for several areas around Region III's inlets. However, turbidity values are generally lowest in the summer months and highest in the winter months, corresponding with winter storm events and the rainy season (Dompe and Haynes, 1993; Coastal Planning & Engineering [CPE], 1989). Moreover, higher turbidity levels can generally be expected around inlet areas, and especially in estuarine areas, where nutrient and entrained sediment levels are higher. Although some colloidal material will remain suspended in the water column upon disturbance, high turbidity episodes usually return to background conditions within several days to several weeks, depending on the duration of the perturbation (storm event or other) and on the amount of suspended fines.[1]

[1]For instance, after average, baseline wave and current conditions are reestablished, it would generally take approximately 72 hours for fines ranging in size 5-9 to settle to the bottom (Fisher, 1994).

3.2.3 Sand Source Location

3.2.3.1 Existing Borrow Area Locations

Palm Beach County: There are four established borrow areas within Palm Beach County: (1) an ebb tidal shoal at Jupiter Inlet; (2) an offshore area at Ocean Ridge; (3) an offshore area at Delray Beach; and (4) an area off Boca Raton.

Broward County: Most of the sand in the established construction borrow areas has already been used for beach nourishment.

Dade County: After the next beach renourishment, all available beach quality offshore sand sources will have been exhausted.

3.2.3.2 Potential Future Borrow Area Locations.

Palm Beach County: Geophysical surveys indicate a potential sand source running the entire length of the county between the two offshore reefs. For estimation purposes, potential borrow area boundaries were kept a minimum of 2,000 feet from shore to insure a water depth of greater than 20 feet. Estimated quantities of available sand borrow are: (1) Jupiter Inlet Colony - 70,000,000 cubic yards; (2) Jupiter Inlet to Riviera Beach (DEP monuments R-12 to R-50) - 274,827,611 cubic yards; (3) Lake Worth Inlet to Manalapan (DEP monuments R-75 to R-130) - 186,713,585 cubic yards; (4) South Lake Worth Inlet to Boca Raton Inlet (DEP monuments R-151 to R-222) - 123,480,486 cubic yards; and (5) DEP monument R-222 to the Broward/Dade County line - 11,765,124 cubic yards. The total estimated quantity of available offshore sand in Palm Beach County is 655,025,947 cubic yards. This quantity of sand is more than enough to satisfy existing renourishment needs of 26,253,000 cubic yards for Palm Beach County.

Broward County: Using the maps produced from the geographic information system (GIS), all available hardground areas were delineated and have been buffered by a distance of 400 feet. Most of the borrow areas have been delineated by geophysical surveys, with few having core borings. Since these areas are in the same situation as all other borrow areas in Dade and Broward counties, it is reasonable to assume that most of the sand is of similar quality and suitable for beach nourishment. Estimated quantities of available sand borrow are: (1) Deerfield Beach to Hillsboro Inlet (DEP monument R-1 to R-24) - 10,518,180 cubic yards; (2) Pompano Beach to Fort Lauderdale (DEP monuments R-24 to R-85) - 16,763,630 cubic yards; and (3) Dania to Hallandale (DEP monuments R-100 to R-128) - 1,376,379 cubic yards. The total estimated quantity of available offshore sand in Broward County is 28,658,188 cubic yards. This quantity represents 73 percent of the needed 39,243,000 cubic yards of sand for existing planned renourishment projects for Broward County.

Dade County: Two potential borrow areas have been identified: (1) an area located eight miles north of Miami Beach with an estimated 1,500,000 cubic yards of available sand; and (2) an area located 16 miles south of Miami Beach with an estimated 2,000,000 cubic yards of available sand. Total project requirements for Dade County are 11,936,000 cubic yards of sand, over five times the available potential borrow quantities. Future renourishment projects in Dade County will require alternate sand sources.

3.2.3.3 Alternate Sand Source Locations

Upland Sources: Offshore sand sources are plentiful in Palm Beach County. However, to the south in Broward County, the quantity of beach quality sand decreases, and in Dade County there are virtually no remaining sand reserves once the next renourishment is completed. Test results on native beach materials and sands available from commercial upland sand quarries indicate that, in most cases, the upland sand sources are texturally very compatible with little or no overfill required. The upland quarries are located on the Lake Wales Ridge of the Central Highlands physiographic region of south Florida. One upland source area is located southwest of Lake Okeechobee, at Ortona, Florida. There are presently two quarries at Ortona, and both have barge canal access to the Okeechobee Waterway.

Bahamian Sand: A second alternate sand source is Bahamian sand. Comprised of 14 major carbonate banks, the Bahamians have a virtually endless supply of nourishment sand for Region III's coastline (CPE, 1994; Hine and Neumann, 1977 [as cited by CPE, 1994]). Leases to dredge 40-75 billion cubic yards of Bahamian sand have already been granted to Marcona Ocean Industries (Miller-Way, *et al.*, 1987; Slatton, 1986 [both cited by CPE, 1994]). Areas outside of the Marcona lease where significant Bahamian sand deposits can be found include the Southern Tongue of the Ocean, Jolten's Keys, the Eleuthera Keys, and Little Bahama Bank. Bahamian sand is currently used as an essential ingredient for Portland glass and cement, filtration media, and agricultural lime, flue gas desulfurization, fine aggregate, and as an additive for poultry and animal feed (Slatton, 1986 [as cited by CPE, 1994]).

3.2.4 Sand Quality

The sand occurring on the beaches and offshore in Palm Beach County is predominantly quartz sand that was carried down to the sea by the Savannah, Altamaha, and other rivers of Georgia and the Carolinas and then driven southward by shore currents and wave action. This sand is coarser near shore, becoming finer with distance offshore. Sand south of Palm Beach County is predominantly carbonate material from disintegrated shells.

3.2.4.1 Native Beach Sand Quality

Palm Beach County: Native beach sands are predominantly quartz, generally well sorted and free from appreciable amounts of deleterious fines (material passing a U.S. No. 200 sieve). In Palm Beach County, the mean grain size ranges from 0.43 millimeter (mm) in the northern portion of the county near Jupiter Inlet to 0.31 mm near Boca Raton Inlet. Silt content (material finer than the No. 200 sieve) is usually less than three percent. Visual estimates of shell content range from one percent to 75 percent, with a composite mean value of 50 percent by weight.

Broward County: The beach sands of Broward County are predominantly carbonate grains and shell fragments with small amounts of quartz grains. Mean grain sizes range from 0.48 mm at Lauderdale-by-the Sea to 0.36 mm at Hollywood in south Broward.

Dade County: As in Broward County, the beach sands of Dade County are predominantly carbonate grains and shell fragments with minor amounts of quartz grains. Mean grain sizes range from 0.36 mm at Miami Beach to 0.29 at Key Biscayne.

3.2.4.2 Potential Borrow Source Quality

From West Palm Beach to the Florida Keys, there are generally three separate series of reefs or hardbottoms located offshore. Generally, there is a sand and rubble zone between the first and second hardbottom areas and more abundant sand pockets between the second and third hardbottom areas. These two zones provide the potential sand resources for beach nourishment.

Palm Beach County: The Jupiter Inlet ebb shoal is proposed as the borrow area for the Jupiter/Carlin project. The mean grain size of the primary borrow area material is 0.38 mm. Offshore borrow areas generally have smaller grain size sands than nearshore sources. The offshore sands in north Palm Beach County have a mean grain size of 0.38 to 0.43 mm and a silt content of around five percent. The offshore sands in south Palm Beach County have a mean grain size of 0.24 to 0.37 mm and a silt content of less than five percent.

Broward County: Potential offshore borrow areas in north Broward County have a mean grain size of 0.30 mm and mean silt content of 9.4 percent, and the borrow areas in south Broward County have mean grain sizes ranging from 0.34 mm to 0.51 mm and mean silt content of 6.5 percent.

Dade County: The potential offshore borrow source near Miami Beach has a mean grain size of 0.31 mm. Test results from a geotechnical study performed in 1978 and 1979 indicate that there was less than five percent material passing a U.S. 200 sieve (silt).

3.2.4.3 Alternate Sand Source Quality

Upland Sources: The quartz sands available from the Ortona, Florida, area southwest of Lake Okeechobee have a mean grain size range of 0.48 mm to 0.55 mm. Silt content is usually less than five percent.

Bahamian Sand: Bahamian sand is typically a bright white carbonite sand found in natural deposits on the Bahama banks. These deposits contain only traces of silt or clay-sized material. The mean grain size is 0.29 mm. The specific gravity of oolitic sand ranges from 2.75 to 2.88, compared to 2.65 for quartz sand. The more dense Bahamian sand behaves hydraulically like larger sized quartz grains. Bahamian sand's higher sphericity, higher specific gravity, and well-rounded texture cause it to have a hydraulic equivalent mean grain size of 0.34 mm.

3.2.5. Hazardous, Toxic, and Radioactive Waste

No hazardous, toxic, or radioactive waste sites are located in the affected environment of COFS action alternatives, nor are there currently any hazardous, toxic, and radioactive waste producers located adjacent or that discharge effluents near any COFS project site.

3.3 Biological Resources

3.3.1 Endangered Species

3.3.1.1 Sea Turtles. Sea turtles are present in the open ocean for much of the year in Region III because of the warm water temperatures and rock habitat used for both foraging and shelter. The predominant species of marine turtles is the loggerhead sea turtle, *Caretta caretta*, although green turtles, *Chelonia mydas*; leatherbacks, *Dermochelys coriacea*; Kemp's ridley, *Lepidochelys kempii;* and hawksbills, *Eretmochelyles imbricata* are also known to exist in the area.

Having the highest average density of sea turtle nests within Region III, Palm Beach County reported a total of 15,013 nests in 1992 over its 34.3-mile survey length, which is 76 percent of its 45 mile shoreline (County of Palm Beach, 1994a). Of this total, 14,357 (95.6 percent) nests were loggerhead sea turtles, 552 (3.7 percent) were green turtles, and 104 (0.7 percent) were leatherbacks. According to the Florida DEP, the endangered hawksbill sea turtle has also been known to nest in the area on an infrequent basis. The Florida DEP considers the nesting season for all species to be 1 March through 31 October (for Palm Beach and Broward counties). Palm Beach County currently relocates only one to two percent of its identified nests to areas of less intense recreational activity and potential disturbance.

Broward County nesting density is less than that in Palm Beach. Overall, 2,221 nests were recorded in 1992 over its 24-mile beach (100 percent survey) (County of Broward, 1993). For all intents and purposes, 100 percent of the recorded nests were loggerheads, although greens, leatherbacks, and hawksbills have been known to nest in the area and some green and leatherback nests were recorded. Beaches listed by decreasing nesting densities are Hillsboro, Pompano, Lloyd Park, Fort Lauderdale, and Hollywood-Hallandale. As with Palm Beach County, the nesting season for all species is between 1 March and 31 October.

Dade County nesting densities are much lower than those of Palm Beach and Broward counties. All of the 21-mile shoreline in Dade County is surveyed for nesting activity, and all nests except from the areas around Golden Beach and Bill Baggs Cape are relocated to a central hatchery on Miami Beach. As either Palm Beach and Broward counties, Dade County nests are predominantly loggerhead; however, greens, leatherbacks, and hawksbills do nest on occasion. In 1992, 200 nests were recorded, of which only one or two percent were greens. Nesting densities south of Government Cut have been documented to be significantly higher than those north of the Cut (Flynn, 1992). The nesting season for the southern Florida area of Dade County is between 1 May and 31 October.

3.3.1.2 West Indian Manatees. Although the estuarine waters around Region III's inlets provide year-round habitat for the West Indian manatee, *Trichechus manatus*, they travel southward in the winter, resulting in a larger winter transient population than during other times of the year. Although the West Indian manatees have been observed in the open ocean, they feed and reside mainly in the estuarine areas and around inlets. A letter from the Florida DEP dated 14 November 1994 indicates that no significant foraging habitat is known to be located in the areas around project sites in Region III, nor have West Indian manatees been known to congregate in the nearshore environments around project sites in Region III.

3.3.1.3 Other Endangered Species. Rare, threatened, and endangered species likely to be encountered along the study areas of Palm Beach, Broward, and Dade counties are listed in Table 3.1. The species that would most likely be impacted by COFS actions are sea turtles and manatees (detailed discussions above).

3.3.2 Sea Grass Beds

Since sea grass is dependent on light penetration for photosynthesis, sea grass beds are found mainly in shallow areas and in areas that maintain clear waters by tidal flushing around inlets (County of Palm Beach, March 1992). Based on maps of existing sea grass beds provided by the FMRI (1994h), there are no sea grass beds offshore or in the immediate vicinity of the inlets; however, there are significant, dense beds east of Key Biscayne and northern Virginia Key. The dominant species of sea grass in decreasing general order of abundance are shoal grass, *Halodule writghtii*; turtle grass, *Thalassia testudinum*; manatee grass, *Syringodium filiforme*, *Halophila decipiens*, *Halophila johnmsonii*, and *Halophil engelmanni*. Macro-algal species found among sea grass beds include *Caulerpa* species (*C. sertularioides, C. prolifera, and C. mexicana*), *Udotea* sp., *Penicillus* sp., *Halimeda* sp., *Dictyota* sp., *Padina* sp., *Hypnea* sp., and *Anthophora spicifera*. Specifically, *Haladule, Syringodium,* and *Thalassia* have been observed in order of decreasing densities in the vicinity of Key Biscayne (Flynn *et al.*, 1991).

3.3.3 Nearshore Communities

3.3.3.1 Soft Bottom. The beaches of southeast Florida are exposed beaches and receive the full impact of wind and wave action. Intertidal beaches usually have low species richness, but the species that can survive in this high energy environment are abundant. The upper portion of the beach, or subterrestrial fringe, is dominated by various talitrid amphipods and the ghost crab *Ocypode quadrata*. In the midlittoral zone (beach face of the foreshore), polychaetes, isopods, and haustoriid amphipods become dominant forms. In the swash or surf zone, beach fauna is typically dominated by coquina clams of the genus *Donax*, the mole crab *Emerita talpoida*. All these invertebrates are highly specialized for life in this type of environment (Spring, 1981; Nelson, 1985; and U.S. Fish and Wildlife Service [USFWS], 1990).

Shallow subtidal soft bottom habitats (0 to 1 meters [0 to 3 feet] depth) show an increasing species richness and are dominated by a relatively even mix of polychaetes (primarily spionids), gastropods (*Oliva* sp., *Terebra* sp.), portunid crabs (*Arenaeus* sp., *Callinectes* sp., *Ovalipes* sp.), and burrowing shrimp (*Callianassa* sp.). In slightly deeper water (1 to 3 meters [3 to 10 feet] depth) the fauna is dominated by polychaetes, haustoid and other amphipod groups, bivalves such as *Donax* sp. and *Tellina* sp. (Marsh *et al.*, 1980; Goldberg *et al.*, 1985; Gorzelany and Nelson, 1987; Nelson, 1985; Dodge *et al.*, 1991). Dexter (1972), Croker (1977), and Shelton and Robertson (1981) have indicated there is no latitudinal pattern of diversity and species distribution among the tropical intertidal sand beach macrofauna.

Table 3.1. Rare, Threatened, and Endangered Species in the Coastal Study Areas of Palm Beach, Broward, and Dade Counties

Common Name	Scientific Name	Notes	Federal	Florida State
Birds				
Peregrine falcon	*Falco peregrinus*	Tr., W., C., Es	E	E
Piping plover	*Charadrius melodus*	Tr., W., C.	T	T
Least tern	*Sterna antillarum*	Tr., N., C.	T	T
Reddish egret	*Egretta rufescens*	Tr., Es	NL	T
Little blue heron	*Egretta caerulea*	Tr., N., Es	NL	SC
Snowy egret	*Egretta thula*	Tr., N., Es.	NL	SC
Tri-colored heron	*Egretta tricolor*	Tr., N., Es.	NL	SC
American oystercatcher	*Haematopus palliatus*	Tr., N., C.	NL	SC
Osprey	*Pandion haliaetus carolinensis*	Tr., C., Es.	NL	SC
Eastern brown pelican	*Pelecanus occidentalis*	Tr., N., C., Es.	NL	SC
Reptiles				
Green sea turtle	*Chelonia mydas*	Tr., N., C.	E	E
Leatherback sea turtle	*Dermochelys coriancea*	Tr., N., C.	E	E
Hawksbill sea turtle	*Eretmochelys imbrictata*	Tr., C.	E	E
Kemp's Ridley sea turtle	*Lepidochelys kempi*	Tr., C.	E	E
Loggerhead sea turtle	*Caretta caretta caretta*	Tr., N., C.	T	T
Gopher tortoise	*Gopherus polyphemus*	C. (Terrestrial)	C2	NL
Fish				
Common snook	*Centropomus undecimalis*	Tr., C., Es.	NL	SC
Mammals				
Right whale	*Eubalaena glacialis*	Tr., O.	E	E
Fin whale	*Balaenoptera physalus*	Tr., O.	E	E
Sei whale	*Balaenoptera borealis*	Tr., O.	E	E
Humpback whale	*Megaptera novaeangliae*	Tr., O.	E	E
Sperm whale	*Physeter catadon*	Tr., O.	E	E
West Indian manatee	*Trichechus manatus*	Tr., C., Es.	E	E
Plants				
Beach jacquemontia	*Jacquemontia reclinata*	C.	E	E
Johnson grass	*Halophila johnsonii*	Es..C.	PT	PT
Sand-dune surge	*Chamaesyce cumulicola*	C.	C2	NL
Garbers spurge	*Chamaesyce garberi*	C.	T	E
Large-flowered rosemary	*Conradiana grandiflora*	C.	C2	E
Cupgrass	*Eriochloa michauxii var. simpsonii*	C.	C2	NL
Hairy beach sunflower	*Helianthus debilis sp. vestitus*	C.	C2	NL
Florida lantana	*Lantana depressa*	C.	C2	NL
Devil's shoestring	*Tephrosia angustissima*	C.	C2	E
Burrowing four-o'clock	*Okenia hypogaea*	C.	NL	E
Beach-star	*Remirea maritima*	C.	NL	E
Bay cedar	*Suriana maritima*	C.	NL	E
Coconut palm	*Cocos nucifera*	C.	NL	T
Beach-creeper	*Ernodea littoralis*	C.	NL	T
Sea-lavander	*Mallotonia gnaphalodes*	C.	NL	T
Inkberry	*Scaevola plumieri*	C.	NL	T
Black mangrove	*Avicennia germinans*	Es.	NL	SC
Red mangrove	*Rhizopora mangle*	Es.	NL	SC

Notes: E = Endangered; T = Threatened; R = Rare; PE = Pending Endangered; SC = Special Concern; NL = Not Listed; Tr = Transient; O = Offshore; W = Wintering; N = Nesting; Es = Estuarine; C = Coastal; C2 = Candidate; PT = Proposed Threatened listing

Sources: County of Palm Beach. 1994b; State of Florida, DEP. 1994e; State of Florida, Florida Game and Freshwater Fish Commission. 1990 [as cited by USACE. 1985].

Surf zone fish communities are typically dominated by relatively few species (Modde and Ross, 1981; Peters and Nelson, 1987). Vare (1991) observed seven species of fish considered to live independent of reef or hard bottom outcrops in the nearshore sand bottom areas off Palm Beach County. Listed in order of their frequency (most common to least common), these were Atlantic threadfin herring, *Opisthonema oglinum*; blue runner, *Caranx crysos*; spotfin mojarra, *Eucinostomus argenteus*; southern stingray, *Dasyatis americana*; greater barracuda, *Sphyraena barracuda*; yellow jack, *Caranx bartholomaei*; and the ocean triggerfish, *Canthidermis sufflamen*, none of which are of local commercial value. Most of the fish making up the inshore surf community tend to be either small species or juveniles (Modde, 1980).

3.3.3.2 Hardgrounds. Exposed nearshore and surf zone hard bottom in Palm Beach County consists of outcrops of coquina rock that are part of the Anastasia Formation. These outcrops, commonly referred to as "beach rock," are comprised of coquina shells, sand, and calcareous limestone (Hoffmeister *et al.*, 1967). The Anastasia Formation dates from the Late Pleistocene and extends southward along Florida's east coast from St. Augustine to slightly south of Boca Raton, where it grades into the contemporaneous Miami Oolite formation (Lovejoy, 1987). The Miami Oolite Formation, outcropping in Broward and Dade counties, is composed of minute calcareous spherules or ooids formed in seawater by the precipitation of lime around microscopic particles in the water column. These precipitated particles settle to the bottom and eventually become bound together by secondary calcite to form a hard substrate (Hoffmeister *et al.*, 1967).

Where they outcrop, both these geologic formations exhibit the spur and groove characteristics of reefs formed in areas exposed to wave action (Shinn, 1988). Although they outcrop only intermittently, both formations are contiguous beneath the beach zone. Only their higher profile areas are exposed by wave action and become available as hard bottom or beach rock habitats (Duane and Meisburger, 1969). Beach rock outcrops are typically located in 0 to 3 meters (0 to 10 feet) of water and are physically stressed environments characterized by variable wave action, sediment transport, turbulence, and water clarity.

Several studies have shown that the nearshore and surf zone beach rock outcrops seen along Florida's southeast coast are ephemeral in nature, being alternately covered and uncovered by shifting beach sand (Ginsburg, 1953; Gore *et al.*, 1978; Goldberg, 1982; Arthur V. Strock and Associates, Inc., 1983; Continental Shelf Associates, Inc., 1984, 1985, and 1987). Gilmore *et al.* (1981) and Continental Shelf Associates (1985, 1987) indicate that some larger outcrops may be more permanent environmental features.

Rock outcrops serve as a habitat for epibenthic species that can secure themselves to the hard substrate. Species present on nearshore rock outcrops must be extremely tolerant of fluctuation in the physical environment. This community is generally characterized by low profile encrusting and boring organisms. Outcrops located within the surf zone are well scoured by suspended sediments and wave action. This scouring prohibits settlement or subsequently kills the larvae of many sessile marine invertebrates (Jackson, 1979).

The exact composition of the community developed around such outcrops depends upon the physical features of the specific outcrop, its distance from shore, and its vertical relief. The width and vertical profiles of an outcrop formation determine its overall significance both as a biological resource and as a natural wave break. Larger outcrops normally show an increase in habitat heterogeneity, which in turn is reflected in increased biomass, greater species abundance, and increased biodiversity (Peters and Nelson, 1987; Luckhurst and Luckhurst, 1978; Vare, 1991). Evaluating the biological community associated with a nearshore rock outcrop requires consideration of habitat stability (permanence) and the structural complexity (rugosity and/or profile characteristics) of the specific outcrop.

The epibenthic community associated with low profile, smooth, intertidal and subtidal rock outcrops is best characterized as an algal mat community dominated by a number of filamentous algal species, including *Cladophora* sp., *Chaetomorpha linum*, and *Gelidiopsis panicularis*. Other algal species observed commonly only on subtidal rocks include *Jania rubens*, *Wrangelia argus*, and *Bryothamnion seaforthii*. The green algae *Ulva lactuca* and the barnacle *Tetraclita squamosa* are dominant species on exposed intertidal rocks (Continental Shelf Associates, Inc., 1984). Along rock outcrops offering greater profile, the algal community is dominated by *Caulerpa sertularioides, Dasycladus vermicularis, Padina* sp., *Dictyota* sp., *Halimeda* sp., and *Lyngbya* sp. (Vare, 1991). Other large macroalgal species characteristic of southeast Florida nearshore rock outcrops are *Bryothamnion seaforthii, Wrangelia argus, Codium* sp., *Gracilaria* sp., and *Caulerpa racemosa* (Continental Shelf Associates, Inc., 1985). The type of marine algae present at a given location is dependent upon the chemical nature of the substratum and the physical nature of the environment at that location. Taylor (1979) suggest that along the nearshore rock outcrops of southeast Florida, wave action and sand scouring are the factors controlling algal community distribution.

Comparisons of an April and December survey of the algal mat community at Boca Raton indicate there is a decline in the number of algal species present, a shift in the dominant species, and a slight decrease in the algal coverage. Algal species that appeared more prevalent during the winter survey were *C. racemosa, Padina profunda, C. mexicana, B. seaforthii,* and *Dictyota* sp. *Wrangelia argus,* which was very common on the Boca Raton rock platform in April, was quite rare during December (Continental Shelf Associates, Inc., 1985).

Vare (1991) listed a total of 42 encrusting and 33 non-encrusting macro invertebrate species found along the nearshore rock outcrops of Palm Beach County. Six phyla were observed to predominate at the stations he quantitatively analyzed. In order of descending percent composition these were: Cnidaria 45 percent (Hydrozoa 26 percent and Anthozoa 19 percent); Porifera 17 percent; Mollusca 11 percent; Arthropoda 11 percent; Echinodermata 9 percent; and Annelida 7 percent. Those species with the highest frequency of occurrence were the star coral *(Siderastrea radians)*, various species of wine glass hydroids *(Campanularia* spp.), several species of tube type sponges, the boring sponge *Cliona celata,* the worm rock building polychaete *Phragmatopoma lapidosa,* and the fire coral hydroid *Millipora alcicornis* (Vare, 1991). The encrusting macroinvertebrate community does not appear to vary significantly by season (Continental Shelf Associates, Inc., 1985). Mobile epibenthic species such as sea urchins, brachyuran and xanthid crabs, and the Florida lobster, *Panulirus argus* were more frequently observed in the spring and summer than in the winter. Most of these species were seen in holes and crevices along the vertical face of rock outcroppings (Continental Shelf Associates, Inc., 1985; Vare, 1991).

Worm rocks formed by colonies of *Phragmatopoma lapidosa* have been described from Cape Canaveral to as far south as the Cape Florida Lighthouse on Key Biscayne (Kirtley and Tanner, 1968). These polychaetes live in tubes, which they build about themselves by cementing sand grains together. They are quite common along Palm Beach and northern Broward counties, and in some areas they build large and biologically significant structures called "worm rock reefs." *Phragmatopoma lapidosa* requires constant high-energy wave action to supply food, remove waste products, and maintain the suspension of sand grains required for tube building. Generally, worm rock colonies are seen on hard substrate in the near intertidal, along rock jetties, and around the mouths of inlets. Worm rock supports a diverse assemblage of other invertebrate species and in some cases provides habitat for juvenile and cryptic fish species (Kirtley, 1974; Gore *et al.*, 1978; van Montfrans, 1981; Gilmore *et al.*, 1981). Rudolph (1977) observed 88 species of other polycheate annelids living in association with worm rock reefs. Gore *et al.* (1978) and van Montfrans (1981) described a rich decapod crustacean community associated with the worm rock habitat. By providing hard and stable substrate, shelter, and food, worm rock colonies allow many species to inhabit the surf zone that otherwise would be unable to survive there (Gore *et al.*, 1978).

Fish assemblages associated with beach rock outcrops along the southeastern Florida coastline essentially comprise a mixture of coastal pelagic, surf zone, and reef fishes attracted to the cover and food source provided by these nearshore hard substrates. The coastal pelagic species seen are primarily migratory species, including the Spanish mackerel, *Scomberomorus maculatus*; bluefish, *Pomatomus saltatrix*; mullets, *Mugil* sp.; and some jacks, *Caranx* sp, of which only Spanish mackerel and mullet are of any local commercial value. These species may be seen near rock outcrops during their migrations, but they are not specifically attracted to them. Surf zone fishes as a group are those species that typically occur on open sand or shell bottom throughout the western Atlantic and Gulf of Mexico. Typical surf zone fish species seen along the rock outcrops of southeast Florida include Atlantic croaker, *Micropogonias undulatus*; pompano, *Trachinotus carolinus*; jacks, *Caranx* sp.; snook, *Centropomus undecimalis*; anchovies, *Anchoa* sp.; and herrings, *Clupea* sp., none of which are commercially harvested locally. These species are not confined to nearshore rock outcrops and occur along the sandy periphery of such outcrops when they exist in the nearshore zone (Herrema, 1974; Futch and Dwinnel, 1977; Gilmore, 1977; Gilmore *et al.*, 1981). Reef fishes are always associated with some form of bottom structure, man-made or natural. Although reef fish reach their peak abundance along the offshore reefs, the presence of the Anastasia and Miami Oolite formations in the nearshore environment do attract some of those species. Species seen along the nearshore rock outcrops include grunts, snappers, groupers, and wrasses, as well as some of the damselfish, blennies, gobies, angelfishes, and parrot fishes, of which only snappers and groupers are of any local commercial value. Vare (1991) indicates that the most frequently observed, year-round resident fish species along the nearshore rock outcrops of Palm Beach County include the sergeant major, *Abudefduf saxatilis*; spottail pinfish, *Diplodus holbrooki*; cocoa damselfish, *Pomacentrus variabilis*; slippery dick, *Halichoeres bivittatus*; and doctorfish, *Acanthurus chirurgus*. All these species are considered primary reef fish (Stark, 1968) and can be assumed to be drawn to the nearshore rock outcrops because of the hard substrate habitat provided there.

Vare (1991) suggested that the nearshore rock outcrop communities of southeastern Florida may serve as a critical linkage between the estuaries and deeper offshore reefs for many important sport and commercial fish species with estuarine life stages. Structures associated with these nearshore hard bottom outcrops may provide juveniles of many offshore species with a temporary habitat in which to feed and hide from predation while they grow. In his study of the fish community associated with a nearshore artificial reef off Boca Raton, Cummings (1990) noted the shifting nature in particular life stages observed.

Some reef fish species become permanent residents of nearshore rock outcrops. The bluehead wrasse, *Thalassoma bifasciatum*, and bicolor damselfish, *Pomacentrus partitus*, which are quite common along nearshore rock outcrops (Vare, 1991), are examples of such permanent residents. Both these species are extremely territorial and once established live their entire lives in a given territory ranging from one to several square meters. For these and other primary reef fish species, the nearshore rock provides a habitat for breeding, nursery activities, feeding, and protection.

3.3.4 Offshore Communities Potentially Found In or Near the Proposed Borrow Sites

Generalized proposed borrow areas set forth in the *Feasibility: Coast of Florida Erosion and Storm Effects Study, Region III*, October 1996, (USACE, Jacksonville District) are based on preliminary sand thickness (isopach) and side-scan sonar hard bottom maps. The biological communities in and adjacent to these proposed borrow areas are relatively consistent throughout this three-county area, although their exact species composition may vary from site to site based on physical parameters such as distance from shore and hardground profile.

3.3.4.1 Soft Bottom. Offshore soft bottom communities are less subject to wave-related stress than are nearshore soft bottom communities. They exhibit a greater numerical dominance by polychaetes as well as an overall greater species richness than their nearshore counterparts. Seasonally, there is extensive macroalgal growth in these areas, with species of green algae (*Caulerpa* sp., *Halimeda* sp., and *Codium* sp.) being particularly abundant in the summer and the brown algal species (*Dictyota* sp. and *Sargassum* sp.) being more abundant in the winter (Courtenay *et al.*, 1974; Florida Atlantic University and Continental Shelf Associates, Inc., 1994). The sea grass *Halophila decipiens* has been observed in the nearshore soft bottom communities offshore of Region III, but is considered seasonal (April through November) in these offshore soft bottom areas (Jim Berry, 1984, Palm Beach County Health Department, personal communication).

Barry A. Vittor & Associates, Inc. (1984) reported polychaetes made up 68.9 percent of the macrobenthic community off Port Everglades, followed by mollusca (13.2 percent), arthropods (10.7 percent), echinoderms (1.2 percent), and miscellaneous other groups (6.0 percent). Goldberg (1985) reported polychaetes as the dominant taxon from his infaunal survey off northern Broward County. Dodge *et al.* (1991) found polychaetes to be the most abundant group in 18 meters (60 feet) of water off Hollywood, Florida. In March 1989, polychaetes made up 51.7 percent of the macrofaunal community at that location followed by nematodes (14.3 percent), smaller species of crustaceans (9.0 percent), oligochaetes (4.3 percent), nemerteans (3.6 percent), and bivalves (2.9 percent).

Larger members of the invertebrate macrofauna seen occasionally in these offshore soft bottom areas between the second and third reef lines include the queen helmet, *Cassia madagascariensis*; the king helmet, *Cassia tuberosa*; Florida fighting conch, *Strombus alatus*; milk conch, *Strombus costatus*; Florida spiny jewel box, *Arcinella cornuta*; decussate bittersweet, *Glycymeris decussata*; calico clam, *Macrocallista maculata*; tellin, *Tellina* sp.; and cushion star, *Oreaster reticulatus*. Commercially valuable species, such as the Florida lobster, *Panulirus argus* move through this area as they migrate from offshore to nearshore areas (Courtenay *et al.*, 1974).

Herrema (1974) reported over 300 fish species as occurring off southeast Florida. Approximately 20 percent of these species were designated as "secondary" reef fish. Secondary reef fish are fish species that, although occurring on or near reefs, are equally likely to occur over open sand bottoms. Many of these species, such as the sharks, jacks, mullet, bluefish, sailfish, and marlin (none of which have significant local commercial value), are pelagic or open water species and are transient through all areas of their range. Fish species specifically associated with the sand flats and soft bottom areas between the first and second reefs off Palm Beach, Broward, and Dade counties include lizardfish, *Synodus* sp.; sand tilefish, *Malacanthus plumieri*; yellow goatfish, *Mulloidichthys martinicus*; spotted goatfish, *Pseudupeneus maculatus*; jawfish, *Opistognathus* sp.; stargazer, *Platygillellus (Gillellus) rubrocinctus*; flounder, *Bothus* sp.; and various species of gobies and blennies, none of which have significant local commercial value.

3.3.4.2 Hardgrounds. The classic reef distribution pattern described for southeast Florida reefs north of Key Biscayne consists of an inner reef in approximately 15 to 25 foot (5 to 8 meters) of water, a middle patch reef zone in about 30 to 50 foot (9 to 15 meters) of water, and an outer reef in approximately 60 to 100 foot (18 to 30 meters) of water. This general description was first published by Duane and Meisburger (1969) and has been the basis for most descriptions of hardground areas north of Government Cut, Miami since that time (Goldberg, 1973; Courtenay *et al.*, 1974; Lighty *et al.*, 1978; Jaap, 1984). Development of these three reef terraces into their present form is thought to be related to fluctuations in sea level stands associated with the Holocene sea level transgression that began about 10,000 years ago.

Lighty *et al.* (1978) showed that active barrier reef development took place as far north as the Fort Lauderdale area as late as 8,000 years ago. It is possible that the reefs and hardground areas seen from Delray Beach southward are the result of active coral reef growth in the relatively recent past, whereas the hard bottom features seen north of Palm Beach Inlet may represent the outcropping of older, weathered portions on the Anastasia Formation. The reefs north of Palm Beach Inlet (Lake Worth Inlet) do not show the same orientation to shore as those to the south and the classical "three reef" hardgrounds description begins to differ north of that inlet (Continental Shelf Associates, Inc., 1993a).

Algal coverage on the offshore hardground areas fluctuates seasonally. The most common algal species observed within southeast Florida offshore hardground areas are *Caulerpa prolifera*, *Codium isthmocladum*, *Gracillaria* sp., *Udotea* sp., *Halimeda* sp., and various members of the crustose coralline algae of the family Corallinaceae. Algal growth is most luxuriant from late July through late October or early November, and there seems to be a particular burst or bloom in the macroalgal population in conjunction with the seasonal upwelling that occurs in late July or early August (Smith, 1981, 1983; Florida Atlantic University and Continental Shelf Associates, Inc., 1994).

The composition of hardground biological assemblages along Florida's east coast has been detailed by Goldberg (1970, 1973), Marszalek and Taylor (1977), Raymond and Antonius (1977), Marszalek (1978), Continental Shelf Associates, Inc. (1984; 1985; 1987; 1993b), Wheaton (1987), and Blair and Flynn (1989). Although there are a large variety of hard coral species growing on the reefs north of Government Cut, these corals are no longer actively producing the reef features seen there. The reef features seen north of Government Cut have been termed "gorgonid reefs" (Goldberg, 1970; Raymond and Antonius, 1977) because they support such an extensive and healthy assemblage of octocorals. Goldberg (1973) identified 39 species of octocorals from Palm Beach County waters. The U.S. Environmental Protection Agency (1992) lists 46 species of shallow water gorgonids as occurring along southeast Florida. Surveys by Continental Shelf Associates, Inc. (1984; 1985) identified 33 sponge, 21 octocoral, and 5 hard coral species on offshore reefs off Ocean Ridge and 40 sponge, 18 octocoral, and 14 hard coral species on the offshore reefs off Boca Raton. Wheaton (1987) identified 17 octocoral species on the deep reefs off the City of Palm Beach. Blair and Flynn (1989) described the reefs and hard bottom communities off Dade County and compared them to the offshore reef communities from Broward and Palm Beach counties. They documented a decrease in the hard coral species density moving northward from Dade County to Palm Beach County. Despite this gradual decrease in the density of hard coral species present, the overall hardground assemblage of hard corals, soft corals, and sponges seen along southeast Florida's offshore reefs remains remarkably consistent throughout the counties of Dade, Broward, and Palm Beach.

Commercially, the most important invertebrate species directly associated with these hardground areas is the Florida lobster, *Panulirus argus*. The reefs are also economically important as the foundation for a thriving sports diving industry. Herrema (1974) listed 206 species of primary reef fish as occurring off Broward and Palm Beach counties. This assemblage is numerically dominated by wrasses, damselfishes, sea basses, parrotfishes, grunts, and angelfishes. The precise composition of the fish assemblage associated with any given location along these hardground areas is dependent upon the structural complexity of the reef at that location.

3.3.5 Inlet Communities

Estuarine areas within Region III are bordered by black mangroves, *Avicennia germinans*; red mangroves, *Rhizophora mangle*; white mangroves, *Laguncularia racemosa*; and buttonwood, *Conocarpus erectus*. In many areas, mangrove communities have been impacted or replaced by exotic species, including Australian pine, *Casuarina equistifolia*; Brazilian pepper, *Schinus terebinthifolius*; corktree, *Thespesia populnea*; and melaleuca, *Melaleuca quinquenervia*. Cordgrass, *Spartina alterniflora* is also found among these border mangroves and is the dominant species in many areas (County of Palm Beach, 1994b). Corals (*Siderastrea* sp., *Porites* sp., *Montastrea* sp., *Oculina* sp., *Leptogoria setacea*) and sponges (*Cliona* sp. and *Spheciospongia vesparium*) have limited communities in the highly flushed areas of some inlets. Species found predominantly on jetty structures include the fireworm, *Hermodice carunculata*; Cuban stone crab, *Menippe nodifrons*; flat crab, *Plagusia depressa*; *Haliclona viridis* and *Haliclona* sp.; varieties of sponges; colonial anemone, *Zoanthus sociatus*; colonial anemone, *Palythoa variabilis*; solitary anemone, *Bunodosoma granuliferum*; hydroid, *Campanularia marginata*; stinging hydroid, *Macrorhynchia philipinus*; and the octocoral, *Telesto riisei* (CPE, 1992). Various species of fish and the West Indian manatee also are members of these communities.

Of particular note is the Lake Worth and South Lake Worth Inlet communities, where sand transfer plant operations are planned under the proposed combination of alternatives. Although having similar communities to those discussed above, natural shorelines in Lake worth are limited (Applied Technology and Management, 1995). Most of the shoreline is bulkhead (60 percent), with approximately 19 percent of the shoreline bordered by Mangroves, and 10 percent remaining naturally unvegetated. The remainder (11 percent) of the shoreline is bulkhead with riprap, riprap revetment, or exotic vegetation. *Halodule wrightii*, *Halophila* *decipiens*, and *Halophila johnsonii* comprise over 75 percent of the recorded sea grass beds in the Lake Worth Lagoon System although *Syringodium filiforme*, *Thalassia testudinum* are also present in much lower densities. According to sea grass bed location maps generated by the State of Florida, FMRI (1994h), no sea grass beds are recorded in the immediate vicinity of the inlets. However, dense beds of mixed *Halodule wrightii* and *Halophil sp.* and of Halophila wrightii have been recorded directly east of Peanut Island, west of Lake Worth Inlet. A small but dense patch of *Halodule wrightii* has also been recorded directly west of South Lake Worth Inlet, with extensive beds of mixed *Halodule wrightii* and *Halophil sp.* located southwest of the inlet and *Halodule wrightii* and mixed *Halodule wrightii* and attached macro algal species north of the inlet (Dames & Moore, 1990). Marine communities in the vicinity of the inlet are similar to those generalized in the above discussion, with coral species encrusting atop outcroppings of Anastasia limestone (Applied Technology and Management, 1995). Various fishes and other motile species including the green turtle, loggerhead turtle, and the West Indian manatee have been observed in Lake Worth Lagoon.

3.3.6 Dune Communities

Most of the natural dune communities exist in the northern sections of Region III in Palm Beach County, although some natural dune communities exist in John U. Lloyd Park and other areas of Broward County.[2] The Dade County dune system is also largely artificial.[3] Dominant plant species in the Palm Beach and Broward counties dune communities include sea grapes, *Coccoloba uvifera*; the beach morning glory, *Ipomoea pes-caprea*; beach bean, *Canavalia rosea*; sea oats, *Uniola paniculata*; dune panic grass, *Panicum amarulum*; bay bean, *Canavalia maritima*; and Australian pine, *Casaurina equisetifolia*. As with the Australian pine, the Brazilian pepper, *Schinus terebenthifolius* is an invasive plant, which is predominant in some areas south of Port Everglades in Broward County. Generally, Dade County dune communities are inhabited with these species; however, there are no appreciable amounts of either Brazilian pepper or Australian pine. The beach berry or inkberry, *Scaevola plumieri;* sea lavender, *Mallotonia gnaphalodes*; spider lily, *Hymenocalis latifolia*; beach star, *Remirea maritima*; and coconut palm, *Coco nucifera* are also present in some dune communities. Mammals typically present in dune communities include the raccoon, *Prycon lotor*; house mouse, *Mus musculus*; gray fox, *Urocyon cinereoargenteus*; and spotted skunk, *Spilogale putorius*. Birds utilizing the beach and dune habitats include the American oystercatcher, *Haematopus palliatus*; Eastern

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[2]Dune revegetation in Broward County has included sea oats, *Uniola paniculata*; sand bur, *Xanthium strumarium strumarium*; beach bean, *Canavalia maritima*; beach morning glory, *Ipomea stolonifera*; cucumberleaf sunflower, *Helianthus debilis cucumerifolius*; sea purslane, *Sesuvium portulacastrum*; lantana, *Lantana depressa*; buttonwood, *Conocarpus erectus*; beach elder, *Iva frutescens*; inkberry, *Scaevola frutescens*; seagrape, *Coccoloba uvifera*; tropical almond, [sic]; bitter panicum, *Panicum amarum*; crowfoot grass, *Dactyloctenium Willd*; St. Augustine grass, *Stenotaphrum secundatum*; Australian pine, *Casaurina equisetifolia*; coconut palm, *Cocus nucifera*; silverleaf croton, *Croton punctatus jacq.*; Spanish bayonet, *Yucca aloifolia*; cabbage palm, *Sabal palmetto*; mimusops, *Manilkara roxburghiana*; cocoplum, *Chrysobalanus icaco l.*; and others (Hamilton, 1994).

[3]Dade county species used in artificial dune stabilization include panic grass, *Panicum ararulum*; saltgrasss, *Distichlis spicata*; sea oats, *Uniola paniculata;* dropseed, *Sporobolus virginicus*; seashore paspalum, *Paspalum vaginatum*; beach bean, *Canavalia maritima*; beach creeper, *Ernodea littoralis*; beach elder, *Iva imbricata*; beach morning glory, *Ipomea stolonifera*; beach sunflower, *Helianthus debilis*; camphorweed, *Heterotheca subaxillaris*; railroad vine, *Ipomea pes-caprae*; sea purslane, *Sesuvium portulacastrum*; seaside evening primrose, *Oenothera humifusa*; spider lilly, *Hymenocallis* sp.; wild sage *Lantana involucrata*; bay cedar, *Suriana maritima*; cocoplum, *Chrysobalahus icaco*, inkberry, *Scaevola frutescens*; Jamaica caper, *Capparis cynophallophora*; limber caper *Capparis flexuosa*; mysine, *Mysine floridana*; necklace pod, *Sophora tomentosa*; saw palmetto, *Serenoa repens;* seagrape, *Coccoloba uvifera*; silver buttonwood, *Conocarpus erectus* v. *cericeus*; sweet acacia, *Acacia faresiana*; varnish leaf, *Dodonaea viscosa*; wax myrtle, *Myrica cerifera*; white indigo berry, *Randia aculeata* (Flynn and Halwani, 1990).

brown pelican, *Pelecanus occidentalis carolinensis*, great blue heron, *Ardea herodia*; great egret, *Casmeodius albus*; least tern, *Sterna albifrons*; osprey, *Pandion haliaetus*; laughing gull, *Larus atricilla*; and the common tern, *Sterna hirundo*. Sea turtles (*Caretta caretta, Chelonia mydas,* and *Dermochelys coriacea*) also use the lower regions of dune communities for nesting, with loggerheads nesting more frequently than other species.

3.3.7 Migratory Birds

Based on database reports of the Florida Game and Freshwater Fish Commission, there are over 80 species of birds listed in the Federal Migratory Bird Treaty Act that have been recorded as inhabiting Region III's coastline between the surf zone and densely vegetated forest of the back dune for at least part of the year. However, very few species utilize the beach and dune areas in Region III because of Region III's intense coastal development. Birder reports note that only sanderlings, *Calidris alba*; and ruddy turnstones, *Arenaria interpres* are generally the only wintering species that can be found foraging and resting on beaches along Region III's coastline (Rosenburg, 1994). Royal terns, *Sterna maxima*; ring-billed gulls, *Larus delawarensis*; laughing gulls, *Larus atricilla*; and herring gulls, *Larus argentatus*, also winter along Region III's coastline and are generally found foraging and resting near fishing piers and on beaches adjacent to piers. Occasional winterings of other species can be found near the dune and beach zones.

3.4 Socioeconomic Resources

3.4.1 Demographics

Region III is composed of a virtually contiguous stretch of development spanning from the West Palm Beach metropolitan area southward to Greater Miami and Key Biscayne. Details of the socioeconomic profile of this region are contained in the Economics Appendix of the *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996,* USACE, Jacksonville District; however, highlights are discussed herein (USACE, 1991).

Population in Region III has grown from approximately 3.2 million persons in 1980 to 4.1 million persons in 1990, and population is expected to grow 7.7 percent between 1990 and 2000 and 27.1 percent between 2000 and 2035. Populations in 1990 of coastal cities in Palm Beach, Broward, and Dade counties were 85,929; 83,176; and 124,117; respectively. Coastal census tracts include only a small portion of county populations but a large segment of coastal city populations. Coastal census tract populations for 1990 in Palm Beach, Broward, and Dade counties are 49,230; 40,294; and 110,802; respectively.

Coastal census tract data reveal that proportionately more single-family, non-family, and single householders over the age of 65 live in these areas. Additionally, these data indicate that a smaller portion of the non-white population lives in the coastal census tracts than in the rest of Region III.

3.4.2 Employment/Income

Employment in this area is diverse but driven by tourism. Accordingly, the services sector is the most important employing sector in all three counties within Region III, followed by retail trade, financial, and government sectors. Information on coastal-dependent industries is described below. Employment is anticipated to grow through 2035; however, the rate of growth is expected to decline from current levels. Unemployment has generally not been a major concern in Region III. In fact, Region III's unemployment during 1989 and 1990 varied from a high of 7.35 to a low of 5.14 percent.

Dade, Broward, and Palm Beach counties ranked first, second, and third in the State for total personal income. Population density of this Region is the main factor responsible for these rankings. However, per capita income in Palm Beach is the highest in the State, and Broward and Dade counties, fifth and 13th, respectively.

3.4.3 Coastal-Dependent Industries

Coastal-dependent industries such as commercial fishing, recreational fishing charters and party boats, diving charters and rentals, and other businesses are numerous in the coastal areas of Region III. According to data provided on aggregated county business patterns for the counties in Region III, there are approximately 17 fishing, hunting, and trapping establishments; 13 refrigerated warehousing and storage; 77 marinas; 88 travel tour operators; 111 fish and seafood wholesalers; 207 meat and fish retail markets; 429 sporting goods and bicycle shops; 9 sporting and recreational camps; and 182 membership sports and recreation clubs.

National Marine Fisheries Landings Reports reveal that commercial catches have increased most significantly in Broward County between 1970 and 1980. Between 1980 and 1990 catches have remained fairly constant as a region (1.56 percent average annual increase), although within the region, Broward County catches increased 66 percent (5.2 percent average annual growth), whereas both Dade and Palm Beach counties' catches declined slightly. Since 1990, Broward County catches have declined slightly and both Dade and Palm Beach catches have increased. Moreover, the combined Region III has experienced an approximate 5.91 percent average annual growth in its fisheries' catches, having a total 1993 catch of 7,386,651 pounds worth $14,512,624 (U.S. Department of Commerce, NMFS, 1994). Based on 1993 landings reports, important commercial fish species (based on catch value over $100,000 by species in 1993) for the region are (in decreasing value) swordfish, spiny lobster, king mackerel and cero, yellowtail snapper, shrimp, sheepswool sponge, bluefish, bigeye tuna, gag grouper, jumbo stone crabs, pompano, snapper (mutton), bigeye shad, and dolphinfish. Most of these species are found in state waters within three miles of shore; however, some species (swordfish, dolphin fish, and bigeye tuna) are found further offshore (five to six miles). Several species (shrimp and sheepswool sponge) are typically harvested within a mile of shore. Marine life collection for aquariums is another water dependent industry in Region III. Collections in 1991 and in 1994 were both similar in targeted organisms and quantities harvested. Marine life landings in Palm Beach, Broward, and Dade counties in 1991 were valued at over $460,000 and were dominated by anemones, live rock and sand, snails, crabs, and angelfish. As noted, landings for 1994 were of similar value (approximately $440,000) and were dominated by the same targeted organisms (State of Florida, FMRI, 1994c). Although marine organisms are not necessarily landed in the same county in which they are caught, landing reports are the most comprehensive data available to display marine life collection trends in Palm Beach, Broward, and Dade Counties' waters.

3.4.4 Land Use

Land use in the vicinity of Region III's shoreline is fairly limited to affluent single family residential, seasonal and permanent multifamily residential, hotels, public recreation and open space, limited commercial retail sales, other water-dependent commercial enterprises, and public works.

3.4.5 Storm Damages

Between 1871 and 1950, 12 recorded hurricanes have struck Region III's coastline, and since 1950, approximately seven significant storm events have caused considerable damage to Region III's coastline and upland areas. Damages from hurricanes and northeasters occur from both high winds and storm surges and increased wave activity. Inundation caused most damages in past hurricanes; however, high winds also played a significant role and were the dominant destructive force in Hurricane Andrew in 1992. Total damages for hurricanes that have affected Region III's coastline have been estimated to be $28 million (1950$) for King in 1950; $600 million (1990$) for Cleo in 1964; $131.2 million (1994$) for Betsy in 1965; $5 million (1990$) for David in 1979; and $15-20 billion (1993$) for Andrew in 1992.[4] Two northeasters, the Halloween Northeaster of 1991 and the Thanksgiving Day Northeaster of 1984, also caused significant damage to Region III's coastline, causing $2 million (1991$) and $1 million (1984$) in damages, respectively (USACE, 1996).

3.5 Cultural Resources

Many significant cultural resources are known to exist within Region III of COFS. Because the entire Region III study area has not been subjected to a systematic survey, additional potentially significant resources may be located there. The types of cultural resources located within COFS study areas include: archeological resources located on the beach; underwater historic shipwrecks; and historic structures located near the shoreline.

Although potentially significant cultural resources exist in Region III, such resources are not likely to be located in areas that have been disturbed by previous construction activities. Areas where significant cultural resources are not anticipated include previously used borrow areas, maintenance dredged material from existing Federal projects, and previously nourished beach segments.

3.6 Recreational Resources

3.6.1 Beach Activities

Beach activities available on Palm Beach, Broward, and Dade counties vary in type and extent. No Florida State or national wildlife refuges or management areas, forests, wilderness areas, trails, estuarine or research reserves exist along coastal Palm Beach, Broward, or Dade counties, Florida (State of Florida, Division of Recreation and Parks, 1994d). The Biscayne

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[4] Total damages include but not limited to Region III. Only damage estimates for Hurricane Betsy (1964) reflect damages to Region III only (Palm Beach, Broward, and Dade counties). Details of these storm events and damage estimates can be obtained from the *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, April 1996,* USACE, Jacksonville District and *Florida Hurricanes and Tropical Storms, 1871-1993: An Historical Survey*. Doehring et. al. (1991).

National Park, Biscayne Bay-Cape Florida State Aquatic Preserve, the Biscayne Bay-Card Sound Florida State Aquatic Preserve, John D. MacArthur Beach State Park, Hugh Taylor Birch State Recreation Area, John U. Lloyd Beach State Recreation Area, Oleta River State Recreation Area, North Shore State Recreation Area, and Bill Baggs Cape Florida State Recreation Area are the only official national or state recreational resources documented in the coastal areas of Region III. In addition, the Barnacle, located west of Key Biscayne, is a Florida State Special Feature Site. In addition, three beaches, Juno Beach [Ocean Cay] in Palm Beach County, North Beach in Broward County, and the North Shore Open Space in Dade County, have been acquired by the State of Florida under the "Save Our Coast Program" and are now protected State undeveloped public recreational beaches.

Ample public access is available to local residents and tourists alike, with a total of 218 public access points or an average of approximately one access point every half mile of shoreline. Access is limited by parking availability, which varies greatly and includes both designated parking lots and street parking with hourly and daily parking fees. The 218 public access sites along the coast in Region III have approximately 31 miles of beach frontage with an average of approximately 100 parking facilities per public access point but a median of only eight parking places. This is explained by a few very large recreational areas with many parking places such as Haulover Park, Hollywood Beach, John U. Lloyd State Recreation Area, Delray Beach and others. All of these recreation areas have over 750 designated parking spaces. Some of the larger public areas in terms of square yards of beach include Crandon Park, Pompano Beach, Lummus Park, and the John U. Lloyd State Recreation Area. Although available facilities differ among sites, 44 sites have lifeguards, 91 sites have showers, 24 sites have potable water, and 35 sites have restrooms.

3.6.2 Water Related Activities

Water related activities in Region III vary from onshore fishing to offshore fishing and diving. Most boating activities (diving and recreational boat fishing) originate from inlets and are concentrated within limited distances from these points. According to the *Florida Scuba News* (1994b), listed dive shops are concentrated in Miami, Fort Lauderdale, Pompano Beach, Riviera Beach, West Palm Beach, and Boca Raton. Operating dive boats also reflect this concentration. Miami, Riviera Beach, and Fort Lauderdale have over nine listed dive boat operations *(Florida Scuba News,* 1994a). Accordingly, the Government Cut, Port Everglades, Lake Worth inlets, Boyton Inlet, and the Boca Raton Inlet are the most important origination points for dive operations. Discussions with a very limited number of dive-charter boat operators revealed that travel is kept to approximately 30 minutes from port, which corresponds typically to four to six miles north or south of the inlets. Furthermore, most trip destinations are to the second and third reef zones and artificial reef areas. Significant resources noted by operators include "the Breakers" reef off West Palm Beach, Pompano Pier reef off the Pompano Pier, and the Key Biscayne artificial reef zone.

According to data obtained from the FMRI, there are approximately 592 recorded fishing sites (estuarine, open ocean, and fresh water) along the coastal areas of Region III; however, only 106 of these sites are recorded as having a high probability of encountering anglers (State of Florida, FMRI, 1994b and 1994g). Of these 106 sites, 19 are open ocean sites with a high probability of encountering anglers, and only six are actually fishing piers on the ocean with the same high probability (North Deerfield Beach Fishing Pier, Fisherman's Warf Pier in Pompano

Beach, Anglin Pier at Lauderdale-by-the-Sea, Dania Fishing Pier, Newport Fishing Pier in Sunny Isles, and South Point Park Fishing Pier at Miami Beach). The most popular fishing areas are from eleven beaches, while two others provide only private boat access (Riverfront Marina in Fort Lauderdale, Elizabeth Virrick Boxing Gym and Boat Ramp in Miami, and Virginia Key Recreation Complex in Miami). As noted, however, many sites or recreational fishing origination points are located in the estuary areas along the intercoastal waterway and inlets.

Creel survey data on kept quantities of fish landed suggest that approximately 55 percent of recreational fishing is done from the shore, 41 percent from private boats, and only four percent from charter boats (State of Florida, FMRI, 1994f). These data also suggest that the ten most important recreational species in order of importance for Palm Beach County are dolphin, false pilchard, little tunny, blue runner, king mackerel, white grunt, yellowtail snapper, striped mojarra, herring, and gray (grey) snapper, with several of these species sought only for recreational fishing bait (false pilchard, blue runner, white grunt, and herring). The ten most important species in Broward County are false pilchard, dolphin, king mackerel, blue runner, bigeye scad, white grunt, little tunny, yellowtail snapper, spanish mackerel, and crevalle jack, again with several species used predominantly for bait (false pilchard, blue runner, bigeye scad, and white grunt). Like Broward and Dade counties, landings are dominated by false pilchards used mainly as bait fish. The nine most important species besides the false pilchard are dolphin, white grunt, pinfish, blue runner, little tunny, bluestriped grunt, yellowtail snapper, ballyhoo, and king mackerel, with the only gamefishes in the top ten landings list being dolphin, little tunny, yellowtail snapper, and king mackerel. Most listed species are found within state waters (three miles offshore), with several found very close to shore (false pilchard, grunts, runners, and bigeye scad). Several species are found further out (dolphin, little tunny [bonita]). Still others are found mainly in the intercostal waterway and shallow waters around shore (stripped mojarra, crevalle jack, and pinfish) (Schaffer, 1994).

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Physical Setting

4.1.1 Impacts

Projects proposed within Region III of COFS will not generally affect the physical setting of the region; however, minor aesthetic impacts would occur during the construction phase and post-construction for most of the action alternatives. The presence of construction equipment and personnel would detract from the natural aesthetics of the beach environment. However, permanent structures (sand transfer plants) would not likely create any significant aesthetic impacts based on the relative level of existing anthropogenic disturbance and activity in the location of the Lake Worth, and South Lake Worth inlets. Post-nourished beach sand color will generally be different from the native beach sand (depending on sand source), detracting from the natural aesthetic quality of project beaches. The no-action alternative, however, would allow beach erosion to continue, also diminishing beach aesthetic values.

Small to undetectable changes in the wave climate in the nearshore environment (approximately 5-foot depth) would likely result from borrow site excavation and nearshore berm construction. However, as predicted for a similar project by Coastal Technology Corporation [CTC] (1993), these impacts would likely be insignificant.[5] The no-action alternative should not allow conditions to develop that will significantly affect wave climate; however, further erosion will allow the surf zone to advance landward and thereby increase storm damage impacts and costs.

Direct emissions from COFS's action alternatives would be confined to exhaust emissions of labor transport equipment (land and water vehicles), and construction equipment (dredge barges), and likely well under the *de minimus* levels for ozone non-attainment areas as cited in 40 CFR 91.853; that is, projects implemented cannot produce total emissions greater or equal to 100 tons per year of Volitle Organic Compounds (VOCs). Furthermore, although beach restoration may induce tourism and development and indirectly increase emissions (indirect emissions), control and maintenance of these emissions by the USACE would be impractical and infeasible. Consequently, a conformity determination with the Florida State Implementation Plan is inappropriate for increases of indirect emissions from any COFS action alternative implementation. Coordination with local air quality managers in Palm Beach, Broward, and Dade counties will determine if further determination is necessary to evaluate conformity of COFS's action alternatives with the Florida State Implementation Plan. As with COFS's action alternatives, the no-action scenario will witness continued development, which may cause marginal adverse impacts to air quality. The extent of these impacts, however, is difficult to predict.

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[5]CTC (1994) completed several model runs on the Regional Coastal Processes Wave (RCPWAVE). The borrow area used in the model run was approximately 1.8 miles offshore, 4,800 feet long and averaged 800 feet long in depths of -50 to -60 feet. The borrow depth in the model run was from -62 to -70 feet (10 to 12 feet of dredging). Model runs calculated an average of only 0.1 foot increase in prevailing 3 foot waves in the nearshore (within -5 foot contour) environment. Model runs for the 100-year storm wave regime showed similar insignificant changes: 0.02 feet from the northeast, -0.01 feet from the east, and -0.22 feet from the southeast.

4.1.2 Mitigation

Because no significant adverse impacts are expected from the proposed projects on the physical setting of Region III, no mitigation is expected. However, best management practices would be implemented to ensure swift construction and the avoidance of a lengthy presence of construction equipment and personnel.

4.2 Geology/Hydrology

4.2.1 Impacts

Although COFS meets the criteria for a Section 404 (r) exemption under the Clean Water Act, all attempts will be made to obtain a State Water Quality Certificate.[6] Projects proposed in Region III would not likely cause significant adverse effects on the existing geologic and hydrologic environments. Impacts to these environments would largely be confined to temporary, insignificant turbidity impacts to water quality around the borrow and fill areas as a result of nourishment activities. The extent of these impacts, however, would be a function of the dredge and fill methods employed and the amount of fines in the sand source used. Haynes and Dompe (1995 in press) note that cutterhead/suction dredge operations generally have greater turbidity impacts than hopper dredge operations.[7] However, similar turbidity impacts have been documented for both cutterhead/suction and hopper dredge operations (CPE, 1991; County of Dade, 1990).[8] Monitoring reports (CPE, 1991; County of Dade, 1990) suggest that hopper style dredging may result in higher turbidity around the borrow sites than would occur under suction/hydraulic dredge operations, but turbidity around the fill site would likely be lower with a hopper dredge operation than that experienced with the cutterhead/suction dredge technique.[9] Post-construction monitoring reports for turbidity suggest that turbidity generally settles out

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[6]Section 404 (r) of the Clean Water Act states that any discharge resulting from a Federally approved construction project authorized by Congress is not subject to 404 regulation or any State program approved under Section 404 of the Clean Water Act if information on the effects of the discharge are included in the environmental impact statement (EIS) of the project, and if the EIS has been submitted prior to actual discharge and prior to either authorization or appropriation of construction.

[7]Haynes and Dompe (1995 in press) note that cutterhead/suction dredge operations generally create higher turbidity levels because 1) the cutterhead disturbs some sediment that is not retrieved by the cutter pipe, 2) pipeline leakage enroute to the fill site, and 3) discharge of the slurry onto the beach. This method differs from the hopper dredge operation, which typically allows excess turbid water to spill over the gunwales of the dredge barge, leaving the remaining, generally dewatered, slurry for deposition.

[8]CPE (1991) documented only two exceedences over one month of the Florida 29 NTU-over-background standard for the 1988 North Boca Raton Beach nourishment, which employed a cutterhead/suction dredge. Both of these exceedences occurred within 5,000 feet down current from the discharge pipe and 1,000 feet seaward of the mean high water line. Turbidity within the fill zone monitoring network ranged between 0.20 and 36.50 NTU, with an average of 2.14 NTU (CPE, 1991). Turbidity levels around the borrow area site were low (between 0.20 and 3.90 NTU, with an average of 0.85 NTU), with no recorded exceedances within the 300-foot monitoring radius. Likewise, turbidity levels associated with a hopper dredge and fill operation at Bal Harbor were generally low (typically between 0.7 and 4.0 NTU although several samples greater than 10 NTU and one at 54.3 NTU were documented). One exceedence (54.3 NTU) around the borrow site was recorded for the two-month Bal Harbor Beach nourishment, which used a hopper style dredge (County of Dade, 1990). This exceedence occurred approximately 500 feet seaward and 330 feet south of the dredge. Both projects used borrow material with low pre-dredge percentages of fines (silt and clay): between 0.51 and 1.44 percent for North Boca Raton (CPE, 1991); and approximately 1 percent for Bal Harbor (County of Dade, 1990).

[9]The hopper dredge operation would allow a greater portion of the water collected with the borrow material to be released prior to fill than would a cutterhead/suction dredge operation.

within a short time period after the perturbation.[10] Permanent perturbations (sand-transfer plants) would likely elevate turbidity levels adjacent to discharge points; however, shoal dredge material cleansed daily by tidal flushing would render these impacts insignificant. These permanent structures would also permanently affect littoral drift in the region, cumulatively increasing the shoreline's dependence on maintenance. The use of Bahamian sand as a source material in the southern portion of Region III would alter the color, density, and texture of sand beaches in these areas and in downdrift areas. However, the introduction of Bahamian sand (virtually 100 percent calcium carbonate) should not pose any water quality or beach morphology concerns relative to other sand sources.[11,12,13] Bahamian sand mining in the Bahamas should likewise not create any turbidity or deposit morphology concerns.[14]

Because no hazardous, toxic, or radioactive waste sites or producers should be affected by any COFS action alternatives, no impacts associated with disturbance of these sites are anticipated from either the action or no-action alternatives.

Temporary, insignificant impacts to the nearshore freshwater lens may occur from dune construction activities with saltwater-saturated sand; however, saltwater intrusion into potable groundwater sources is not anticipated to become a problem for any proposed project. The no-action alternative should allow conditions to develop that may induce saltwater intrusion in areas; however, significant landward advances of the freshwater/saltwater interface from beach erosion are not likely.

With the use of dredging equipment and labor in the areas around the borrow and nourishment areas, there is also a potential for hydrocarbon spills or other effluent releases; however, the likelihood of significant accidents and releases of this sort is very remote. The no-action alternative should not allow conditions to develop that would increase accidents or releases of this sort.

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[10] Post-construction monitoring reports for offshore hardground and barrier reef sites around the North Boca Raton borrow site show that turbidity levels fell to background levels within one month of the action (CPE, 1991). Turbidity levels for borrow and fill zone water quality monitoring samples for this project illustrated similar trends. Based on the high variance in daily turbidity level data for the borrow sites, perturbation turbidity likely settled out within several days.

[11] Information on the use of Bahamian sand for beach nourishment was gained solely from CPE (1994), "Feasibility Study For the Use of Aragonite for Beach Nourishment in Broward County."

[12] CPE (1994) completed a literature review that concluded that although native Florida sand generally has lower specific gravity, smaller average grain size, and lower sphericity/larger gradation than Aragonite (Slatton, 1986 [as cited by CPE, 1994]), the use of aragonite may provide more benefits in terms of greater resistance to erosion (Monroe, 1969; USACE, 1985; Slatton, 1986; Miller-Way *et al.*, 1987[all cited by CPE, 1994]), having steeper and more stable foreshores (Cunningham, 1966; Olsen and Bodge, 1991) [both cited by CPE, 1994]) with generally lower turbidity than typical offshore Florida sand deposits or upland sources (CPE, 1985; USACE, 1987 [both cited by CPE, 1994]). Furthermore, the concerns of potential abrasion from harder quartz particles, the dissolution from acidic rain or freshwater, and the cementation of particles into beach rock have all been discredited (Dean, unpublished; CPE, 1985; USACE, 1985; and Olsen Associates, Inc., 1993 [all cited by CPE, 1994]).

[13] Nelson *et al.* (1987) [as cited by CPE (1994)].

[14] CPE (1994) cites Michael (1971), in which he concludes that the Sandy Cay deposit location is subject to intense tidal currents; therefore, neither existing fines and corresponding turbidity nor erosion would likely be exacerbated by dredging in the Sandy Cay shallow bank reserves. Michael (1971) cautions that current velocities should be monitored so that mitigative actions, if needed, could be implemented early in activities. Tabb *et al.*, (1973) as cited by CPE (1994) notes that levees used to confine outwash from the stockpiles on Ocean Cay, east of Sandy Cay, effectively reduce the amounts of fines returning to the ocean.

4.2.2 Mitigation

Best management practices would be used in the excavation of borrow material and for nourishment activities. Specifically, buffer zones and the precision positioning of dredge equipment would be utilized to ensure that turbidity associated effects and the potential for hydrocarbon spills would be minimized.

4.3 Biological Resources

4.3.1 Impacts

4.3.1.1 Endangered Species.

Sea Turtles: Of the endangered species located in the coastal area of Region III, sea turtles are the most likely to be impacted by COFS nourishment projects, and to a lesser extent, dune activities. According to biological opinions for similar projects (USACE, 1987), the major concerns are: (1) timing of nourishment activities, and (2) the burial, compaction, and destruction of sea turtle nests from sand and heavy equipment associated with nourishment activities. Incidental takings of turtles from nest destruction are possible from sand deposition and shore activities associated with nourishment activities; however, mitigation should minimize adverse impacts (takings).[15] Safety lighting of moored dredging equipment may also deter nesting in the vicinity of the project areas of COFS; however, timing of actions and lighting protocols should ameliorate potential impacts.[16] Encounters with sea turtles during dredge operations is also a possibility. Impacts to motile species from dredge operations should generally be minimal, although unacceptable levels of takes have been reported with the use of hopper dredges in navigation channels by the NMFS (Committee on Sea Turtle Conservation, 1990).[17] After nourishment, gains in beach width would also cause concurrent gains in sea turtle nesting habitat.[18] It is estimated that an additional 100, 91, and 24 acres of new beach would be created under the proposed combination of alternatives in Palm Beach, Broward, and Dade counties, respectively. Based on studies of the Fisher Island Beach nourishment (Lutz *et al.*, 1993), the use of Bahamian sand for nourishment activities

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[15] It should be noted that "takings" are noted by Section 9 of the Endangered Species Act as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct with respect to any listed species.

[16] Witherington (1989) studied the effects of mercury vapor lighting and low pressure sodium lighting on the nesting activities of *Caretta caretta* and *Chelonia mydas*. He found that mercury vapor (yellow) lighting and suggested that other broad-spectrum lighting have the potential to disturb nesting activities, while no significant disruptions were observed with the use of low pressure sodium lighting. In a latter study (1991), he found that hatchlings released at both a "naturally dark" and an "artificially lighted" beach swam approximately perpendicular to shore, and the hatchlings released from the lighted beach were not significantly affected by the high-pressure sodium lights located approximately 1 km from the release site. However, hatchlings released on the lighted beach had a greater dispersion angle.

[17] In a 25 August 1995 Regional Biological Opinion of the National Marine Fisheries Service, it was found that hopper dredging without the use of ridgid deflectors could result in unacceptable levels of sea turtle takes.

[18] The North Boca Raton two-year monitoring report documented increased sea turtle nesting densities and fewer nests requiring relocation due to possible inundation from coastal waters (CPE, 1991).

should not adversely affect sea turtle nesting or hatching success significantly.[19] However, there is concern that the temperatures and subsequent incubation times of sea turtle nests in Bahamian sand may be cooler, longer, and prone to produce more males. To date, studies comparing sex ratios of hatchlings incubated on Bahamian sand beaches to those of Florida sand beaches have not been documented (CPE, 1994).[20] Although Bahamian sand is currently under consideration as a sand source for southern Region III, consultation with the USFWS will be completed prior to the use of Bahamian sand in Corps nourishment projects. The no-action alternative would allow erosion on the coast of Region III to continue, decreasing available nesting habitat for sea turtles.

Manatees: Manatee encounters are likely with activities associated with COFS projects, with most likely encounters by support boats moving from marinas and dock areas through the channels and inlets towards dredge vessels (letter from DEP, 14 November 1994a). Based on manatee mortality data compiled by the Office of Protected Species Management of the Florida DEP for the period between 1976 and 1994, there have been 548 watercraft and 158 other human attributed manatee deaths recorded. These numbers reflect that of the total 2,184 recorded manatee mortalities during this period, 25 percent were attributed to watercraft, and seven percent were attributed to other human activity. Furthermore, 698, or 32 percent, of all recorded manatee deaths were of undetermined origin. According to records of the Jacksonville District, USACE, no manatee mortalities have ever occurred from dredge operations or nourishment operations of the Jacksonville District, USACE. However, impacts to foraging, congregation, or resting habitat are not anticipated from any activities of COFS, and accordingly, significant adverse impacts are not likely with mitigating precautions. The no-action alternative would not likely allow conditions to develop that would significantly affect foraging, resting, congregation, or migration habitat of manatees in Region III waters.

Other Endangered Species: Endangered species found in dune communities (all coastal species found in Table 3.1) may be potentially impacted from COFS actions if proper

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[19] The Sea Turtle Laboratory at the Rosenstiel School of Marine and Atmospheric Science recently conducted a three-year study of the loggerhead sea turtle (*Caretta caretta*) nesting along Fisher Island. Miami on a beach renourished with commercially mined Bahamian aragonite (Lutz, *et al.*, 1993). This study included comparisons of temperature, compactability, grain size, grain morphology, water potential, and gas permeability between Bahamian aragonite and Florida silicate beaches. The study found hatching success was high and mortality low in both types of sand. There were no significant differences in grain size, waste potential, or gas exchange between the two types of sands studied. There were no significant differences in hatchling size or mortality between the two types of beaches. No correlation was observed between compactability and nesting success in natural beach sands or the renourished aragonite beach. Nesting success ranged from 70 percent to 75 percent throughout this study. The major difference detected between nests laid on aragonite and silicious sand beaches resulted from the lighter color of the aragonite. The lighter color of the aragonite sands produced "in nest" temperatures that were 1.4 to 2.0°C cooler than those in nests laid on natural beaches. This cooler temperature resulted in an incubation period three to 10 days longer for the aragonite beach nests than for the silicious sand beach nests. These differences are well within the normal physiological ranges for the loggerhead turtle, but some concern was raised that in conditions of lower atmospheric temperature, or increased shading, these lower temperatures could cause excessively long incubation periods, and possibly produce an imbalance in the sex ratios of the hatchlings (Lutz, *et al.*, 1993).

[20] Incubation temperatures have been documented to influence sex determinations in sea turtles (Mrosovsky and Yntema, 1980; Yntema and Mrosovsky, 1980; Miller and Limpus, 1981; Morreale, *et al.*, 1982; Yntema and Mrosovsky, 1982; Mrosovsky, *et al.*, 1984; Limpus, *et al.*, 1985 [sic]; Standora and Spotila, 1985; Spotila *et al.*, 1987; Mrosovsky, 1988; Nelson, 1988; Girondot and Pieau, 1990 [all cited by CPE, 1994]). However, it has also been proposed that there are male- and female-producing regions within the nesting range of each species of sea turtles (Mrosovsky, 1988 [as cited by CPE, 1994]) or segregation of nesting populations (Owens, *et al.*, 1989; Bowen, *et al.*, 1993; and Sears, 1994 [all cited by CPE, 1994]). Moreover, it has also been proposed that sex determination in sea turtles results from an interaction between environmental and genetic mechanisms and not simply the incubation temperature (Zobroski *et al.*, 1979, 1982, 1988; Mrosovsky, *et al.*, 1984; Mrosovsky, 1988; Mrosovsky and Pieau, 1991 [all cited by CPE, 1994]).

reconnaissance is not conducted prior to dune stabilization and construction activities; however, with proper reconnaissance and ameliorative measures prior to such activities, no significant adverse impacts are anticipated. Secondary tourism and development induced from beach restoration activities may further stress existing communities of threatened and endangered dune species; however, with proper permitting and ameliorative actions, impacts of this sort are not anticipated to be significant. The no-action alternative would allow erosion to continue, increasing the probability of dune erosion during significant storm events, which may further endanger these communities. While marginal impacts to threatened and endangered species in inlet communities (Johnson's sea grass) is possible, no significant adverse impacts to inlet community species are anticipated from either the no-action or action alternatives.

Impacts to the threatened seagrass, *Halophila johnsonii*, Johnson's seagrass, is difficult to determine at the present time. Associated impacts will be discussed in tiered documentation after project details become available.

Although the southern extremity of the right whale calving range is located approximately 70 miles north of Region III near the Sebastian Inlet in Brevard County, right whale, *Eubalaena glacialis*, and other whale encounters are possible during COFS action alternative implementation. The most likely whale encounters would be by support boats moving from marinas and dock areas towards dredge vessels; however, the likelihood of encounters is remote. With implementation of proper siting protocols, no significant adverse impacts to whales are anticipated.

Other than the species discussed, no threatened or endangered species would likely be impacted by action alternatives of COFS. Likewise, the no-action alternative should not allow conditions to develop that should cause significant adverse impacts to any threatened or endangered species besides those discussed herein. However, as previously discussed, increases in the potential for dune erosion and subsequent dune community exposure would be result under the no-action alternative.

4.3.1.2 Sea Grass Beds. Impacts to sea grass beds would be largely confined to the Key Biscayne Key nourishment project and possibly inlets based on bed-mapping conducted by the FMRI. Furthermore, based on results of the environmental monitoring of the Key Biscayne Beach restoration project (Flynn, *et al.*, 1991), impacts on sea grass beds should be isolated to direct impacts of sand burial. No impacts associated with turbidity or sand migration were observed in the first-year monitoring of this project.[21] Based on Flynn *et al.* (1991) *Halodule, Syringodium*, and *Thalassia* were observed in the area in decreasing densities. Based on available information, direct impacts to sea grass beds in the vicinity of Key Biscayne are estimated between 6 and 70 acres. Further field investigations are needed to obtain a more accurate estimate of impact. Although storm activity will likely cause some short-term damage to existing sea grass beds in Region III under either the no-action or action alternatives, the no-action alternative would not likely allow conditions to develop that would significantly adversely affect existing grass beds of Region III.

[21]This project as noted in Flynn *et al.* (1991) utilized a single borrow area located between 4,000 and 5,000 feet southeast of the fill zone. Highly compatible with the native beach sand, this mobile shoal had high quality sand with less than 1 percent fines (Flynn *et al.*, 1991).

4.3.1.3 Hardgrounds. Beach nourishment activities of COFS in Region III would cover approximately 31, 25, and 5 acres of hardground habitat within the nearshore environment in Palm Beach, Broward, and Dade counties, respectively (USACE, 1996). Primary effects of coverage and abrasion would occur on the hardground areas in the nourishment zone and in the margin areas, and turbidity impacts would occur north-south and east-west of these zones, with precise areas depending on the geomorphology of the area.

CPE (1989) documented much higher ambient sedimentation rates in the nearshore environment than the offshore environment, illustrating that communities in this area are already naturally selected for turbidity resilience. Higher turbidity and corresponding sedimentation has been documented to stress some coral species. Turbidity impacts were estimated at 1,200 feet north to 850 feet south of the borrow site for the 1990 Bal Harbor renourishment project, where the Dade County (1990) found tissue loss in more than 60 percent of the hard coral colonies within 525 feet of the borrow site.[22] Furthermore, over 50 percent of the hard coral colonies that were surveyed within 100 meters of the borrow site were killed.[23] Soft coral species also exhibited death from burial by accumulated sediment. Stress responses (bleaching) were documented in the stony coral, brain coral (*Meandrina meandrites)*, with higher turbidity episodes; however, no other stress responses were observed by CPE for other stony corals. In addition, no stress responses were documented by CPE (1989) for gorgonian (soft corals) species or other species during increased turbidity events. Goldberg (1985) found reductions in coral species one year after borrow and fill activities, but draws no relationships between dredge and fill activities and coral population reductions.[24] Dodge (1987) was also unable to make a significant correlation between periods of lowered hard coral growth in Broward County and periods of beach nourishment activity.[25] Likewise, Dodge *et al.* (1991) and Dodge *et al.* (1993) were unable to document any pattern of variations in organism abundance and richness relative to

[22]The borrow site for this project is located 1.6 miles offshore and is shaped in a dog-leg approximately 10,500 feet long with an average width of approximately 1,500 feet (County of Dade, 1990). Hardbottom reef areas are located from within 165 to 330 feet away (*Ibid*).

[23]One possible explanation of decline is described by Telesnicki and Goldberg (1994 in press). They document that elevated turbidity levels create an increased respiration stress response in addition to increased mucus production, hydrostatic pumping, and ciliary action in two hard-coral species, *Dichoncoenia sotkesii* and *Meandrina meandrites*. Photosynthesis: respiration ratios less than one display consuming behavior. That is, increases in maintenance energy expended necessarily decreases the amount of energy that would otherwise be used for reproduction.

[24]Goldberg (1985) studied past effects of the beach nourishment activity for the 8.6 mile Lauderdale-By-The-Sea to Pompano Beach segment conducted over 70 days in summer 1983. Three borrow areas located between 1.25 and 2 miles offshore in water depths between -39 and -92 feet were excavated by cutterhead/suction dredges for a total of 1.91 million cubic yards of fill. Silt and clay percentages of the fill were between 3.2 and 5.2, with several anomalously high percentage samples (16-25 percent) (Arthur Strock and Associates, Inc., 1981 [as cited by Goldberg, 1985]). Goldberg (1985) documented that no mechanical damage or sediment loading damage were observed during or 60 days after dredge operations. Furthermore, neither bleaching stress response nor mortality was observed in the 60 days. However, as noted by Goldberg (1985), mortality generally occurs within six weeks of excessively turbid waters. Reductions in Scleractinians and gorgonians were observed in the 15-month post-dredge monitoring; however, sponge populations were not observed to have a pattern associated with dredging over the 15-month post-dredge monitoring period. Furthermore, other factors (an anomalous high turbidity event not associated with dredging activities, a winter storm, and possible cold-water upwelling) could have contributed or been the cause of losses (Goldberg, 1980 [as cited by Goldberg 1985]; Goldberg, 1985).

[25]This study investigated the effects of turbidity and sedimentation on the growth of *D. labyrinthinformis* and *M. annularis* in Broward County. In only one site did *D. labyrinthiformis* exhibit significantly lower normalized growth than control sites (Dodge *et al.*, 1987).

dredge and fill activities one year after the John U. Ll ··d Beach renourishment project.[26] The potential of mechanical damage to reef zones from dre . e operations would likely be greater with hopper dredge operations than with cutterhead/suction dredge operations and has been documented on two occasions in Dade County (County of Dade, 1990; County of Dade, 1988). Hydraulically dredged, Bahamian sand dredging is not likely to cause any damage to hardbottoms. In addition, an operational buffer zone around the defined dredge lease, as used at the Sandy Cay, Bahamas, dredge site, should minimize impacts.[27]

Therefore, there is a potential for some hard coral stress and mortality in the hardground areas and less of a potential for soft coral impacts from turbidity and excessive sedimentation associated with borrow and fill activities. As a group, sponges will be the least affected by these activities. Mechanical damage to reef zones may occur from dredge operations, with hopper dredge operations having a higher likelihood of mechanical damage impacts than with a cutterhead/suction dredge operations. The natural exposure/burial cycles of nearshore hardgrounds would also tend to show longer burial cycles with any of the nourishment activities (USACE, 1994-Fish and Wildlife Coordination Act Report for Jupiter Carlin Beach Nourishment Project). Under both the no-action and action alternatives, storm events and other factors would cause both mechanical damage and turbidity impacts to reef zones in Region III; however, the extent of these damages cannot be predicted. Furthermore, impacts under the no-action alternative would not include those potential mechanical damage impacts and turbidity impacts that may be associated with borrow and fill operations of COFS projects. Under the no-action alternative, less sediment would be in the nearshore environment, which would likely result in greater hardground exposure and corresponding habitat than under nourishment scenarios.

Fish and other motile vertebrates inhabiting the hardgrounds in the nourishment zones would be displaced to other hardground areas nearby or to deeper waters as displayed during storms (CPE, 1989). However, CPE (1991) documented virtually no correlation in motile invertebrates and nearshore fish populations with the area of exposed rock.

Therefore, no permanent, significant adverse impacts from borrow and fill activities are expected to occur to these populations. Likewise, the no-action alternative should not allow conditions to develop that would significantly affect these populations.

4.3.1.4 <u>Softgrounds</u>. In a study conducted seven years after the Hallandale Beach nourishment, Marsh *et al.* (1980) and Marsh and Turberville (1981), as cited by Goldberg (1985), documented that there were no long-term impacts to nearshore infaunal communities from the nourishment. Likewise, Simon and Dauer (1977), as cited by Goldberg (1985), documented infaunal diversity equilibrium one year after defaunation. Gorzelany (1983), also cited by Nelson (1985), found no evidence of adverse effects on nearshore infaunal communities from beach nourishment activities. Moreover, Nelson (1985) concluded that natural seasonal variation in infaunal communities was greater than the estimated effects from beach nourishment based on results of Gorzelany (1983). However, Goldberg (1985) documented major changes in infaunal

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[26]Specific exceptions include Gorgonians, which exhibited greater abundance on dredging reefs after perturbation (Dodge, 1993) and the tanaidaceans and isopods on offshore infaunal monitoring sites, which did not recover within the first year post-construction.

[27]CPE (1994) notes investigations of Tabb *et al.* (1973), which described the ship channel area between Ocean Cay and Sandy Cay as having organisms (coral, sea cucumber, sea star, anemones, etc.) in "good condition" (Tabb, *et al.*, 1973 [as cited by CPE, 1994]).

diversity one year after borrow and fill activities, illustrating slow recovery for infaunal communities.[28] Likewise, major benthic faunal community changes were observed by Dodge *et al.* (1991) and Dodge *et al.* (1993) in both the fill and borrow site monitoring stations.[29] Blair and Flynn (1989) document no turbidity impacts or sand migration impacts to sea grass beds from fill activities within the first year post-construction of the Key Biscayne Beach restoration project of 1987; however, sea grass beds surveyed did not survive direct burial by nourishment. Furthermore, Blair and Flynn (1989) note that algal communities have a slow rate of recovery after perturbations.[30] Based on several studies, the use of Bahamian sand should not pose any additional difficulties for nearshore softbottom communities from exotic introduction.[31] Furthermore, turbidity and sedimentation associated with Bahamian sand dredging operations in the Bahamas should extend for relatively short distances based on findings of Rehrer (1975) [as cited by CPE, 1994].[32] Some sea grass beds are located in the vicinity of Bahamain sand dredging sites; however, based on the homogeneous nature of the area, there are likely extensive areas where sea grass beds can be avoided during dredging operations.[33] However, dredged sites have been noted to serve as sediment sinks in which sea grasses and algal communities colonized in greater areas, perhaps establishing greater grass areas than existed prior to perturbation (Rehrer, 1975 and 1977 [as cited by CPE, 1994]). Tabb *et al.* (1973), as cited by CPE (1994), noted that softbottom communities adjacent to borrow areas showed no indications of decline approximately three years after dredging operations commenced; however, core samples were not discussed in CPE (1994).

Therefore, it is possible that major infaunal diversity changes will occur in the short-term in some nearshore and offshore softbottom areas, with potential equilibrium recovery periods in excess of one year. Recovery will vary in time depending on a variety of factors. Short-term disruption with energy webs may also result; however, explicit impacts of this nature are

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[28]Goldberg (1985) noted major impacts to infaunal diversity, showing slow recovery 15 months after perturbation. Slow recovery could be due to vagaries of predation, migration, patchy recruitment, dependence on recolonization rates on life history, short-term responses by opportunistic species, dredge perturbation, or other factors (Thorson, 1966, and Levin, 1984 [both cited by Goldberg, 1985]; Goldberg, 1985). Specifically, density was reduced but taxonomic diversity was less seriously impacted (Goldberg, 1985). He further adds that the existing literature database as of 1985 was insufficient to make any conclusions of rapid infaunal recovery.

[29]Dodge *et al.* (1991) note that changes in faunal communities around the toe-of-fill monitoring site for the John U. Lloyd Beach renourishment project are likely the result of the change in the sedimentary environment. Furthermore, recovery of the benthic communities around the borrow site for this project had not recovered fully within the first year post-project.

Blair and Flynn (1989) discuss recent findings showing major differences between non-impacted areas and impacted areas in algal communities two years after perturbation. Furthermore, Hanisak *et al.* (1989) as cited by Blair and Flynn (1989) note that there are significant differences in habitat value between disturbed and undisturbed sites.

[31]CPE (1994) cites findings on CSA (1992) of the Fisher Island Study. As found by other studies, infaunal diversity suffered up to two years post-nourishment of the Fisher Island Beach nourishment project (CSA, 1992 [as cited by CPE, 1994]). Furthermore, CPE (1994) notes that the introduction of exotic Bahamian species should not be a problem because: the Gulf Stream reaches both coastal Florida and the Bahamas; oolitic Aragonite already exists on Region III beaches to some extent (USACE, 1987 [as cited by CPE, 1994]); and both Florida and the Bahamas are located in the same biogeographic providence, resulting in similar flora and fauna (Miller-Way *et al.*, 1987; USACE, 1987 [both cited by CPE, 1994]).

[32]Rehrer (1975) finds that elevated turbidity levels extended no more than approximately 0.5 miles west of the Sandy Cay dredging site (as cited by CPE, 1994).

[33] *Thalassia testudinum*, *Syringodium filiforma* and *Halodule wrightii*, and *Halophila engelmanni* as observed by Rehrer (1977), where manatee grass (*Syringodium filiforma*) predominates (Rehrer, 1975 [as cited by CPE, 1994]).

impossible to predict at this time. Effects of Bahamian sand dredging in the Bahamas on the softground infaunal communities of the area is inconclusive from existing literature; however, based on studies at Sandy Cay, Bahamas, no significant adverse impacts from sedimentation can be expected to epibenthic communities adjacent to borrow areas. The no-action alternative would allow erosion to continue in Region III's nearshore zone, but should not allow any conditions to develop that would significantly adversely affect softground communities in the proposed borrow and fill sites; however, under the no-action alternative Bahamian sand dredging would still be conducted in the Bahamas for other pursuits (cement, glass production, and others).

4.3.1.5 Inlet Communities. Inlet communities should not generally be adversely affected from any of COFS project actions. However, as discussed above, increased work-crew boat traffic does increase the probability of manatee encounters. Dredge operations may actually provide temporary increases in hardground habitat in inlets. Secondary impacts of turbidity should not be a major concern due to tidal flushing; however, temporary, insignificant impacts are likely during construction. Permanent perturbations (sand transfer plants) will likely have greater impacts; however, tidal flushed shoal source-material should minimize turbidity. The no-action alternative should not allow conditions to develop that would significantly adversely affect inlet communities; however, under the no-action alternative periodic dredging of proposed project inlets would still be necessary for navigational concerns.

4.3.1.6 Dune Communities. Approximately 100, 91, and 24 acres of new beach would be created under the proposed combination of alternatives in Palm Beach, Broward, and Dade counties, respectively. Temporary impacts to dune community vegetation may occur to vegetation located at the seaward toe of the existing dune during beach fill operations. Temporary impacts on existing vegetation from the placement of saltwater-laden sand in the formation of new dunes may also occur; however, regular inundation with saltwater in these areas from storm events has selectively bred species in this community to be resilient to temporary saltwater inundations. The proposed beach nourishments would help stabilize the existing dune and protect them from erosion. The no-action alternative would continue to allow beach and dune erosion to continue, decreasing available habitat for dune communities species.

4.3.1.7 Migratory Birds. Because of the scarcity of migratory bird sightings and the fact that birds would only be temporarily displaced by anthropogenic activity, no significant adverse impacts are anticipated to migratory bird populations from any COFS project activities. The no-action alternative would continue to allow beach erosion to continue, further decreasing the habitat utilized by the few migratory birds species typically found along Region III's coastline.

4.3.2. Mitigation

4.3.2.1 Endangered Species. Project-specific mitigation plans will be developed as project details become available and will be included in tiered documentation at a later date. However, general mitigative actions are discussed below.

Sea Turtles: Section 7 consultation for the Region III study has been completed with the USFWS. A Biological Opinion (BO) dated October 24, 1996 is included in Appendix D of the EIS. Section 7 coordination with the USFWS will also be conducted, as needed, prior to all actions and future nourishments in order to ensure minimal impact. Furthermore, although Bahamian sand is being considered as a potential source for the Coast of Florida Study, this material will not be used until the appropriate studies have been completed and its use approved by the state and the USFWS. The BO and information received from the Florida DEP, suggest that significant adverse impacts can be largely avoided with the implementation of proper action timing and monitoring of post-nourished beach compaction levels prior to the nesting season (DEP letter dated 14 November 1994a). Prior to any nourishment or borrow activities, personnel will be instructed on the possibility of endangered species encounters and the penalties associated with harming, harassing or killing them. Nourishment and dune activities should be conducted outside of the highest activity of the nesting season in Region III. In some areas of high density nesting, where nesting relocation would be inappropriate, the Corps would not perform nourishment during the main part of the sea turtle nesting season. Furthermore, consideration will be given to areas of excessive erosion (where nesting does not occur or where nesting failure is inevitable) when timing of nourishment activities is considered. If nest relocation is warranted, nests would be relocated by properly trained and permitted personnel between sunrise and 9:00 A.M. each day to a nearby hatchery or safer beach site located away from artificial lights. Furthermore, nourished beaches should be monitored for the 500 cone penetometer index units (CPU) sand compaction standard immediately following completion of the nourishment activity, and before the nesting season, for two years post-nourishment. Beaches exceeding the 500 CPU limit should be tilled to a depth of 36 inches (90 centimeters). Likewise, escarpments exceeding 500 CPU that are greater than 18 inches (45 centimeters) high, and extend more than 100 feet (30 meters), should be mechanically leveled prior to the beginning of the nesting season in Region III. Lighting on sea-moored equipment should meet Coast Guard and OSHA requirements but be kept at a minimum by screening/shielding lights, eliminating lights, and using shielded low pressure sodium lights. Should hopper dredging methods be utilized, conditions established by the NMFS in their 25 August 1995 Biological Opinion on hopper dredging in the southeastern United States would be observed.[34] With the implementation of mitigating measures noted above, no significant adverse impacts are anticipated. Logs of any sea turtle injuries or deaths, that may occur, will be maintained, with immediate notification of any incident to the Jacksonville District, USACE and the USFWS or NMFS as appropriate.

[34]Specifically, the relevant conditions described in the 25 August 1995 NMFS Biological Opinion on hopper dredging in the southeastern United States include: 1) mandated 100 percent inflow screening and suggested 100 percent outflow screening; 2) use of a rigid deflector on the draghead; 3) use of shipboard observers only or special approval by NMFS for use of beach observers; 4) keep dredge pumps disengaged when dragheads are not firmly on bottom; 5) preliminary "take" report within 30 days of completion and a cumulative annual report on impacts to all NMFS endangered species; 6) shipboard monitoring with experienced at-sea large whale observers during intervals between dredge spoil monitoring.

Manatees: According to the Florida DEP, standard manatee protection conditions should minimize potential adverse impacts to manatee populations along coastal Region III (DEP letter dated 14 November 1994a). Signs should be posted on all crew boats and floating work stations informing the crew of the possibility of manatee encounters and of the proper responses should any manatees be in the area. Furthermore, all vessels should operate at "no-wake" speeds at all times in shallow waters, channels, or where the draft of the vessel allows fewer than three feet of clearance to bottom. Vessels should be of light displacement and should follow deep water routes where feasible. Also, upland routes should be used (where available and where less shallow water boat operation would result) for the transport of personnel to fill zones. Finally, logs of manatee encounters (sightings, damage, collisions, or accidental killings) should be kept for the entire contract period and submitted to USFWS and Florida DEP staff after contracts are complete. Any incident involving any listed threatened or endangered species would be immediately reported to both the Jacksonville District, USACE and the USFWS. No significant adverse impacts (takings) are expected to occur with the implementation of these best management practices.

Other Endangered Species: The 25 August 1995 NMFS Biological Opinion on hopper dredging in the southeastern United States noted that the NMFS is unable to make a determination on the collective impacts to Johnson's seagrass, *Halophila johnsonii*, from hopper dredge operations. Annual take estimates should be developed by project and cumulated. These estimates should be reviewed upon completion by the NMFS to develop appropriate ameliorative and mitigative actions.

Standard whale protection measures should minimize potential adverse impacts to right whales venturing into Region III waters. However, should hopper dredging methods be utilized, conditions established by the NMFS in their 25 August 1995 Biological Opinion on hopper dredging in the southeastern United States would be observed.[35] Namely, under the hopper dredge scenario, shipboard observers would be used to look for whales during dredging operations and transportation of material to the fill site. Crews should be informed of the possibility of encounter and of the proper responses should any whales be in the area, namely the avoidance of individuals and the maintenance of at least a 500 foot buffer zone. Also, upland routes should be used (where available and where less boat operation would result) for the transport of personnel to fill zones. As with all listed threatened or endangered species, any incident involving any whales would be immediately reported to both the Jacksonville District, USACE and the NMFS. Finally, as with manatee encounters, logs of whale encounters (sightings, collisions, or other) should be kept for the entire contract period. These would be submitted to NMFS and Florida DEP staff after contracts are complete. No significant adverse impacts (takings) are expected to occur, given the implementation of these best management practices.

4.3.2.2 Sea Grass Beds. Based on available information, preliminary estimates indicate that as little as 6 acres to a maximum of 70 acres of seagrasses could be impacted by beach nourishment at Key Biscayne. Additional field investigations will be required for a more accurate estimate. Project-specific mitigation plans will be developed as project details become

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[35] *Ibid.*

available and will be included in tiered documentation at a later date. Every attempt would be made to avoid and/or minimize impacts to sea grass beds with berm width/slope design modifications where they are encountered. In the event that sea grass beds are unavoidable, mitigation with transplantation to sites outside of the impact zone would be pursued as described by Fonsca (1993).[36] Because this mitigation alternative was documented to be ineffective in the Key Biscayne Beach restoration project, site specific mitigation plans should be developed with the aid of USFWS, Florida DEP, and County of Dade Department of Environmental Resources Management (DERM) staff as needed.[37] Ameliorative and mitigative actions associated with the proposed threatened Johnson's seagrass should be developed in consultation with the NMFS.

4.3.2.3 Hardgrounds. Mitigation for hardground impact due to beach nourishment projects as discussed below is appropriate. However, mitigation may not be appropriate in situations where sand is being placed on the beach downdrift of a navigation inlet to restore a normal flow of sand that has been interrupted by inlet construction and/or maintenance dredging. Project-specific mitigation plans will be developed as project details become available and will be included in tiered documentation at a later date. However, general mitigative actions are discussed herein. The design template for each recommended nourishment project has been designed to avoid and/or minimize impacts to nearshore hardground to the greatest extent practicable. However, some unavoidable impacts to these resources would occur by burial. Preliminary estimates suggest that approximately 31, 25, and 5 acres of nearshore hardgrounds would be impacted from the recommended plan (USACE, 1996). Borrow area design will ensure sufficient buffer areas (presently planned at 400 feet) to minimize impacts of turbidity and mechanical damage on offshore hardgrounds. Precision positioning of equipment, with a Geographic Positioning Systems, will aid in avoidance of sensitive areas. Unavoidable impacts to hardgrounds would likely be post-project mitigated. Post-project mitigation accomplished no sooner than one year after project completion, and no later than two years after project completion, is necessary in order to allow the beach to come to equilibrium and to enable accurate estimates of the time-weighted average area of permanently impacted hardgrounds. In-kind mitigation through habitat replacement with limestone boulders, artificial reef modules of limestone and concrete, or concrete riprap should be incorporated into the project mitigation plans after the time-weighted area of impacted hardgrounds are calculated. A mitigation loss to replacement ratio of 0.5 to 1 was used by the USFWS of the U.S. Department of the Interior for nearshore hardground impacts mitigation for the Jupiter/Carlin Segment shore protection project; however, depending on the habitat value and the physical characteristics of the impacted hardgrounds, higher replacement ratios may be enforced and discussed in the project-specific mitigation plans (USACE, 1994). According to the working plan published by NMFS in 1985, artificial reefs should be designed primarily for impacted species and secondarily for users, utilizing the best available scientific information on species habitat (USACE, 1994 - Fish and Wildlife Coordination Act Report for the Jupiter Carlin, Palm Beach County Beach Nourishment Project). Accordingly, siting of project mitigation would ideally be on-site, targeting the locally impacted species for habitat construction. However, in cases where mitigation cannot be performed on-site, nearby locations will be identified and chosen based on the following ranking

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[36]Fonsca, M. 1993. *Guide to Planting Sea Grasses in the Gulf of Mexico.* TAMU-SG-94-601.

[37]Seventy acres of sea grass beds were transplanted from the nourishment zone to barren areas several miles from the dredge area. Three-foot by three-foot "turfs" were mechanically removed and planted in four-foot intervals (Flynn *et al.*, 1991). Only 10.4 percent of the 70 acres survived one year after transplant (Dade County DERM, unpublished memorandum [as cited by Flynn *et al.*, 1991]).

criteria: (1) existing platform; (2) similar depth regime, wave action, currents, light availability, and other physical characteristics; (3) location with respect to impact areas of other projects; (4) location with respect to areas claimed for salvage or other private or public concerns; and (5) location with respect to public access. This last criteria (5) is concerned with public access to facilitate public SCUBA diving and snorkeling recreation, but it should be noted that this is only a secondary concern, less important to the decision-making than are the criteria associated with enduring habitat value. Therefore, although of secondary concern, artificial reefs should be both aesthetically pleasing and safe for divers, as well as primarily a functional and enduring replacement habitat.[38] No significant adverse impacts to hardgrounds are anticipated with the implementation of mitigation plans as noted above.

4.3.2.4 Softgrounds. Although major loss of softground fauna and infauna may occur in some borrow and fill areas in the short-term from COFS projects, no long-term (longer than several years) and, therefore, no significant adverse impacts are anticipated from COFS actions. Accordingly, no mitigation would be necessary for impacts to softbottom communities.

4.3.2.5 Inlet Communities. Because no significant adverse impacts to inlet communities are anticipated from COFS projects, no mitigation would be necessary.

4.3.2.6 Dune Communities. Because no significant adverse impacts to dune communities are anticipated from COFS projects, no mitigation would be necessary.

4.3.2.7 Migratory Birds. Because no significant adverse impacts to migratory bird species are anticipated from COFS projects, no mitigation would be necessary.

4.4 Socioeconomic Resources

4.4.1 Impacts

Projects proposed in COFS would span over several years, and geographically, over three counties in southeast Florida. Although some of the labor would be hired locally, many of the dredge companies are based outside of Region III; therefore, benefits from the spending of earned wages from project labor would be only partly felt by Region III economies. Slight increases in population may occur with the migration of transient labor and their families; however, impacts to social services should be insignificant. Many of the temporary construction workers would move to other areas for employment after contracts are complete, leaving only insignificant numbers of workers and families in Region III.

Based on existing low unemployment of Region III, employment should not be significantly adversely affected during this transition. Furthermore, employment rates would

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[38] Functionality of artificial reefs is further defined in the Fish and Wildlife Coordination Act Report for the Jupiter Carlin, Palm Beach County Beach Nourishment Project (USACE, 1994). Specifically, artificial reefs should have, " . . .1) extensive unshaded horizontal surface area for the attachment and growth of gorgonians and macroalgae; 2) openings near the bottom, for Spiny lobster, depth of at least 2 foot, and height of no more than 1 foot.; 3) interstitial spaces of approximately 10 cubic foot.; 4) large overhanging ledges to provide shaded resting space for large fish, particularly common snook; 5) numerous projections, crevices, and holes ranging in size from one to three inches in width and up to 1 foot in length (projections) and up to one foot in depth (holes and crevices). These smaller features are intended to provide refuge for small fish and for juvenile fishes, as well as provide additional surface area for epibiotic growth" (USACE, 1994 - Fish and Wildlife Coordination Act Report for the Jupiter Carlin, Palm Beach County Beach Nourishment Project).

likely benefit during the construction of COFS projects, with direct jobs (construction and supply employment) and indirect jobs (employment associated with the spending of workers' wages) increasing. The major benefit of the projects within COFS to local communities would be the avoidance of storm damages. Commerce from increased Region III beach recreation associated with COFS projects would be an incidental benefit. Estimates suggest that an average annual equivalent recreational benefit as great as $8.7 million could be realized in Region III with the implementation of the recommended plan (USACE, 1996).

Based on model runs displayed in the Economics Appendix of the *Feasibility Report, Coast of Florida Erosion and Storm Effects Study, Region III, October 1996,* USACE, Jacksonville District, approximately $33 million in damages would be prevented for the 10 to 20 year return interval storm under the preferred alternatives. No significant adverse impacts to commercial and recreational fisheries industries of Region III are anticipated because motile species would be able to relocate during perturbations. Although temporary turbidity and sedimentation impacts to the diving industry may occur, peak diving periods during the summer months would also be peak turtle nesting months during which beach nourishment and dredging activities would be suspended. The no-action alternative would allow erosion to continue and conditions develop that would result in potential damages for the 10 and 20 year storms in the year 2000 of $8.6 and $12.0 million. Furthermore, although the extent of the effects on the Region III economy cannot be predicted accurately, the no-action alternative would continue to allow beaches to erode, decreasing valuable beach recreation commerce.

4.4.2 Mitigation

Because significant adverse impacts are not anticipated to the socioeconomic environment of Region III from the implementation of COFS projects, no mitigation would be necessary.

4.5 Cultural Resources

4.5.1 Impacts

Cultural resource compliance for Region III of COFS includes coordination with the Florida State Historic Preservation Officer (SHPO), an analysis of the proposed alternatives, and determination of which resources may be present and the possible effects on those resources. Coordination with the SHPO for the Draft Environmental Impact Statement was initiated in a letter dated 9 November 1994, with response dated 8 December 1994. According to the Florida SHPO, activities that would likely affect historic shipwrecks include sand bypassing at inlets using conventional dredging, construction of groins and/or offshore breakwaters, construction of sand traps, and offshore borrowing.

The scope of work for any required fieldwork will be based on in-house analysis of the project alternatives for possible effects on significant cultural resources and consultation with the SHPO. It is not likely that significant cultural resources are located in areas that have been previously dredged. Generally, these will not be subjected to a cultural resource magnetometer survey.

The Corps disposes of sand on beach segments that have been affected by erosion. Placement of sand on the beach would protect historic and archeological sites from the effects of erosion. Similarly, it is the District's determination that placement of dredged material in nearshore disposal areas will not adversely affect significant underwater archeological resources.

4.5.2 Mitigation

Project-specific mitigation plans will be developed as project details become available and will be included in tiered documentation at a later date. During the planning phase for each project, an archival and literature search will be conducted, in addition to consultation with the SHPO. Any required field investigations will be based on consultation with SHPO and will be conducted in compliance with the National Historic Preservation Act as amended (PL 89-665), the Archeological and Historic Preservation Act, and 36 CFR Part 800.

During the planning phase for each project located within Region III, SHPO coordination will be conducted in addition to an archival and literature review to determine if significant cultural resources may be located in the area of impact. Magnetometer surveys will be conducted for offshore borrow areas and sand bypass systems at inlets. The results of these surveys will be coordinated with the SHPO, in compliance with the National Historic Preservation Act, as amended, and 36 CFR Part 800. In consultation with the SHPO, buffer zones will be established to protect potentially significant magnetic anomalies identified in the area of impact. If these potentially significant anomalies cannot be avoided, then the anomalies will be investigated by archeological divers under the direction of the Corps.

4.6 Recreational Resources

4.6.1 Impacts

With the implementation of COFS projects, beach widths and the corresponding recreational value of beaches would increase in the long run. It is estimated that an additional 100, 91, and 24 acres of new beach would be created under the proposed combination of alternatives in Palm Beach, Broward, and Dade counties, respectively. Recreational analysis suggests that an average annual equivalent benefit of $8.7 million would be realized in Region III with the implementation of the recommended plan (USACE, 1996). However, short-term adverse aesthetic impacts associated with water turbidity and viewscape of construction equipment and personnel would likely occur in many areas. Sand transfer plants would not likely detract significantly from the aesthetic value of proposed sites, since these proposed sites' aesthetic value as these areas (Lake Worth, and South Lake Worth inlets) are areas of significant existing disturbance and anthropogenic activity. Nearshore snorkeling, SCUBA diving, and fishing activities may also be impacted by increased turbidity during nourishment and shortly thereafter. Specifically, natural nearshore reef areas currently utilized by snorkelers and SCUBA divers will diminish and be replaced by mitigating artificial reefs, which are less aesthetically pleasing. Long-term adverse impacts to these water activities from nourishment are not anticipated. Boat operations may be detoured during construction activities; however, the extent of these detours and time frame of operations render these impacts insignificant.

4.6.2 Mitigation

Because no significant adverse impacts are anticipated to beach or water related recreation in Region III from COFS projects, no mitigation would be necessary.

4.7 Other Considerations

4.7.1 Cumulative Impacts

Discussion of cumulative impacts must be referenced to a historical point from which incremental project impacts are added and compared to assess the cumulative effects of all projects considered. An example of a historic reference point could be the Florida Atlantic coastline prior to inlets and other anthropogenic activity. This coastline was wider, reflecting a beach in equilibrium. With regard to this reference point, cumulative benefits towards the natural coastline would be realized by all projects under COFS. Furthermore, hardgrounds exposed from erosion of the natural shoreline since perturbation would simply be reburied, more closely reflecting the natural nearshore coastline. Another reference point from which cumulative impacts could be gauged is the pre-project conditions. Under this reference point, cumulative impacts or losses of nearshore hardgrounds, and impacts of coastal turbidity would occur. Secondary socioeconomic benefits of development and increased tourism may also occur cumulatively from COFS actions. This may further endanger existing upland habitat, increase the probability of sea turtle and manatee encounters, and further deter migratory species from Region III's coastline. However, continued development in the area, with similar effects, would also occur under the no-action scenario.

4.7.2 Coastal Barrier Resources Act

The purpose of the Coastal Barrier Resources Act is to minimize the loss of human life, wasteful expenditure of Federal monies; and the damage to fish, wildlife, and other resources associated with the coastal barriers along the Atlantic coast by restricting future Federal expenditures and financial assistance, which have the effect of encouraging development of these coastal barriers. Except for two parcels near Dania Beach in Broward County (P14A), no project locations in Region III are "undeveloped coastal barriers" as defined in the Coastal Barrier Resources Act; therefore, most project sites are not included in the Coastal Barrier Resources System and are not within the jurisdiction of the Coastal Barrier Resources Act. Beach fill activities around the two Coastal Barrier Resource units must be coordinated with representatives of USFWS.

4.7.3 Florida Coastal Zone Management Program

The effect of the COFS projects would be enhancement of the coastal zone's appearance and suitability for beach recreation and restoration of some of the coastal zone's ability to provide protection against storms. Review of this Environmental Impact Statement by the State of Florida will comprise the consistency review under the Florida Coastal Zone Management Program (CZMP). The Corps has determined that the Coast of Florida Erosion and Storm Effects Study, Region III is consistent with the Florida CZMP at this stage. A Federal Consistency Evaluation is included as Appendix B.

4.7.4 Irretrievable and Irreversible Commitments of Resources

The environment of the COFS activities is dynamic and generally resilient with respect to perturbation. Cyclical coverage and exposure of hardbottoms and seasonal beach profile cycles both illustrate that the effects from COFS action alternatives are reversible. Sand transfer plants will incur greater irretrievable economic and labor resources in reversing project effects. Accordingly, no significant irretrievable or irreversible commitments of resources would be made with any of COFS's action alternatives, but small irretrievable energy, labor, and hard structure materials commitments would be made during the construction efforts and operation of all alternatives (discussed below). Under the no-action alternative, erosive conditions would develop that would threaten turtle nests and resulting sea turtle populations. These erosive conditions would also threaten life and coastal property, both of which are irreversible and irretrievable in nature.

4.7.5 Energy Requirements

Energy requirements of COFS action alternatives would be minimal, confined to fuel for labor transportation and construction/dredge equipment. Sand transfer plants would require energy while in operation and, therefore, will create a net increase in area energy consumption during the entire project lives; however, impacts to area and national energy reserves would be insignificant. The no-action alternative would allow conditions to develop that may endanger coastal property from storm surges and wave erosion during significant storm events in the future. On-site preventive actions and post clean-up under the no-action alternative would likely demand greater energy than that which would be required in the implementation of any COFS action alternatives.

4.7.6 Future Renourishment Impacts

Future renourishment projects would have similar impacts as described in the sections above; however, available nourishment material will become more scarce, particularly in Broward and Dade counties. Each future renourishment project will be evaluated separately as a tiered environmental document, augmenting general impact analyses found herein, and monitoring results of initial nourishment effects.

4.7.7 Compliance with Federal Statutes, Executive Orders, and Policies

Coordination with Federal, State, and local agencies is incomplete as of the production of the Draft Report on 17 January 1995. However, coordination efforts to date have not revealed inconsistencies or potential problems associated with final full compliance with all relevant statues, Executive Orders, and policies listed in Table 4.1.

Table 4.1. Compliance with Federal Statutes, Executive Orders, and Policies

Statutes, Executive Orders, and Policies	Project Compliance
Federal Acts	
Archeological and Historic Preservation Act, as amended. 16 U.S.C. 469, *et seq.* P.L. 93-291	Partial compliance: initial coordination complete
Clean Air Act, as amended, 42 U.S.C. 1857h-7; *et seq.* P.L. 91-604	Full compliance
Clean Water Act, as amended, (Federal Water Pollution Control Act) 33 U.S.C. 1251, *et seq.* P.L. 92-500	Partial compliance
Coastal Barrier Resources Act, 16 U.S.C. 3501, *et seq.* P.L. 97-348	Partial compliance: coordination associated with two coastal barrier resource parcels in Broward County still necessary
Coastal Zone Management Act, as amended, 16 U.S.C. 1451, *et seq.* P.L. 92-583	Full compliance
Endangered Species Act, as amended, 16 U.S.C. 1531 *et seq.* P.L. 93-205	Full compliance
Estuary Protection Act, 16 U.S.C. 1221, *et seq.* P.L. 90-454	Full compliance
Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1(12), *et seq.* P.L. 85-72	Full compliance
Fish and Wildlife Coordination Act, 48 Stat. 401, as amended, 16 U.S.C. 661, *et seq.* P.L. 86-624	Partial compliance
Land and Water Conservation Fund Act, as amended, 16 U.S.C. 4601-4601-11, *et seq.* P.L. 88-578	Not applicable
Marine Mammal Protection Act 16 U.S.C. 1361, *et seq.* P.L. 92-522	Full compliance
Marine Protection, Research and Sanctuaries Act, 33 U.S.C. 1401, *et seq.* P.L. 92-532	Full compliance
National Historic Preservation Act, as amended, 16 U.S.C. 470a, *et seq.* P.L. 89-655	Full compliance
National Environmental Policy Act, as amended, 42 U.S.C. 4321, *et seq.* P.L. 91-190	Partial compliance
River and Harbor Act, 33 U.S.C. 401, *et seq.*	Not applicable
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, *et seq.* P.L. 83-566	Not applicable
Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271, *et seq.* P.L. 90-542	Not applicable
Executive Orders	
Floodplain Management (E.O. 11988)	Full compliance
Protection of Wetlands (E.O. 11990)	Full compliance
Protection and Enhancement of Environmental Quality (E.O. 11514, amended E.O. 11991)	Full compliance
Protection and Enhancement of the Cultural Environment (E.O. 11593)	Full compliance
Federal Compliance with Pollution Control Standards	Full compliance
Other Federal Policies	
CEQ Memorandum of August 11, 1980: Analysis of Impacts on Prime and Unique Agricultural Lands in Implementing NEPA	Not applicable
CEQ Memorandum of August 10, 1980: Interagency Consultation to Avoid or Mitigate Adverse Effects on Rivers in the Nationwide Inventory	Not applicable
Migratory Bird Treaties and Other International Agreements listed in the Endangered Species Act of 1973 as amended. Section 2(a) (4)	Full compliance

5.0 LIST OF PREPARERS

Name	Discipline/Expertise	Role in EIS Preparation	Experience
Mr. Leonard Guilbeau Gulf Engineers & Consultants	Geologist	Geology; Sand Source Quantity and Quality Analysis	5-years, Gulf Engineers & Consultants 28-years, Louisiana Department of Transportation and Development
Mr. Scott L. Hoffeld Gulf Engineers & Consultants	Natural Resources Planner/Socioeconomist	Project Manager, Principal Author	3-years, Gulf Engineers & Consultants
Dr. Michael Loden Gulf Engineers & Consultants	Senior Environmental Scientist	1st Tier Supervision, Gulf Engineers & Consultants	5-years, Gulf Engineers & Consultants 10-years, Jefferson Parish, Louisiana Department of Environmental Quality
Mr. John Thompson Continental Self Associates	Marine Biologist	Hardground and Softground Affected Environment and Impact Review	6-years, Harbor Branch Oceanographic Institute 14-years Continental Self Associates
Mr. Michael Dupes USACE Jacksonville District	Biologist	Document Review	20 years, USACE Jacksonville District
Nancy C. Shaw Gulf Engineers & Consultants	Editor/Typist	Editing and typing report.	7-years, Gulf Engineers & Consultants
Peggy G. Strother Gulf Engineers & Consultants	Typist	Typing report.	4-years, Gulf Engineers & Consultants

6.0 PUBLIC INVOLVEMENT, REVIEW AND COORDINATION

6.1 Public Involvement Program

Scoping letters were sent on 8 November 1994 to local sponsors; Federal, State, county, other local authorities; and other interested parties and organizations. A copy of this letter appears in Appendix C. This letter requested input on significant ecological, cultural, aesthetic, and socioeconomic issues that should be considered in evaluating impacts of the COFS projects. The Notice of Intent to prepare the Draft Environmental Impact Statement was published in the Federal Register on 28 November 1994. Several responses were received as of the production of the draft document on 17 January 1994. Copies of responses also appear in Appendix C. Issues of concern raised by respondents and county officials interviewed include: (1) the accuracy of hardground locations on GIS maps; (2) symbol consistency on nearshore hardground GIS maps; (3) the paucity of data on the impacts of Bahamian sand on gender development in turtle nests; (4) sedimentation impacts associated with borrow and fill activities; (5) the potential destruction of nearshore hardground habitat from nourishment burial; and (6) the design and/or need of particular projects located in Region III.

6.2 Required Coordination

Coordination with relevant Federal, State and local agencies was performed by the Jacksonville District. Copies of relevant correspondence from this coordination appear in Appendices C and D. The Draft Environmental Impact Statement (DEIS) and/or a Notice of Availability will be circulated to Federal, State and local governmental agencies including the public and special interest groups. Recipients are listed in section 6.3 below.

6.3 Statement Recipients

Federal Agencies

Advisory Council on Historic Preservation, Washington, D.C.
Environmental Protection Agency, Washington, D.C.
Environmental Protection Agency, Atlanta, Georgia
Department of the Interior, Office of the Secretary, Washington, D.C.
Department of the Interior, U.S. Fish and Wildlife Service, Atlanta, Georgia
Department of the Interior, U.S. Fish and Wildlife Service, Vero Beach, Florida
National Marine Fisheries Service, Panama City, Florida
National Marine Fisheries Service, St. Petersburg, Florida
National Marine Fisheries Service, Miami, Florida
Federal Emergency Management Administration, Washington, D.C.
Federal Emergency Management Administration, Atlanta, Georgia
Federal Maritime Commission, Washington, D.C.
U.S. Department of Commerce, Director, Ecology and Conservation Office, Washington, D.C.
Housing and Urban Development, Atlanta, Georgia
U.S. Coast Guard, Seventh District, Miami, Florida
U.S. Forest Service, Department of Agriculture, Atlanta, Georgia
Center for Disease Control, Atlanta Georgia

Soil Conservation Service, Gainesville, Florida
Department of Energy, Washington, D.C.

State Agencies

Florida State Clearinghouse, Department of Community Affairs, Tallahassee, Florida
Florida Department of Environmental Protection, Florida Marine Institute, Tequesta, Florida
Florida Department of Environmental Protection, Office of Aquatic Preserves, Ft. Pierce, Florida
Florida Department of Environmental Protection, Bureau of State Lands, West Palm Beach, Florida
Florida Department of Environmental Protection, Division of Beaches and Coastal Systems, Tallahassee, Florida
Division of Historical Resources, State Historic Preservation Officer, Tallahassee, Florida
South Florida Water Management District, West Palm Beach, Florida
Florida Game and Fresh Water Fish Commission, Tallahassee, Florida

Local Agencies

Palm Beach County Board of County Commissioners, West Palm Beach, Florida
Palm Beach County Environmental Resources Management, West Palm Beach, Florida
Palm Beach County Parks and Recreation, Lake Worth, Florida
Palm Beach County Heath Unit, Environmental Science and Engineering, West Palm Beach, Florida
Palm Beach County Planning, Zoning, and Building, West Palm Beach, Florida
Palm Beach County Soil and Water Conservation, West Palm Beach, Florida
Palm Beach County Tourist Development Council, West Palm Beach, Florida
Broward County Department of Natural Resources Protection, Ft. Lauderdale, Florida
Broward County Administrator, Ft. Lauderdale, Florida
Broward County Planning Council, Ft. Lauderdale, Florida
Broward County Board of County Commissioners, Ft. Lauderdale Florida
Dade County Department of Environmental Resource Management, Miami, Florida
Dade County Board of County Commissioners, Miami, Florida
Metro Dade Planning Department, Miami, Florida
Metro Dade Park and Recreation Department, Miami, Florida
Director, Public Works Department, Miami, Florida
Jupiter Inlet District, Jupiter, Florida
Port of Palm Beach District, Rivera Beach, Florida
South Lake Worth Inlet District, Lantana, Florida
Florida Inland Navigation District, Jupiter, Florida

Hillsboro Inlet Improvement and Maintenance District, Ft. Lauderdale, Florida
Director, Port Everglades Authority, Ft. Lauderdale, Florida
Treasure Coast Regional Planning Council, Palm City, Florida
South Florida Regional Planning Council, Hollywood, Florida

Individuals and Interest Groups

Florida Audubon Society, Casselberry, Florida
Isaak Walton League, Palm Beach, Florida
Florida Wildlife Federation, Tallahassee, Florida
Professor John Gifford, Rosenstiel School of Marine and Atmospheric Science, Miami, Florida
Environmental Services, Inc., Jacksonville, Florida
Caribbean Conservation Corporation, Gainesville, Florida
TAMS Consultants, New York, New York
Biodiversity Associates, Laramie, Wyoming
American Littoral Society, Miami Florida
American Littoral Society, Key Biscayne, Florida
Sierra Club - Loxahatchee Group, Lake Worth, Florida
Sierra Club, Miami Florida
Audubon Society of the Everglades, West Palm Beach, Florida
Royal Palm Audubon Society, Boca Raton, Florida
Tropical Audubon Society, Miami, Florida
Florida Oceanographic Society, Stuart, Florida
Florida Marine Conservation Corporation, West Palm Beach, Florida
Florida Shore and Beach Preservation Association, Tallahassee, Florida
Florida Shore and Beach Preservation Association, Singer Island Chapter Riviera Beach, Florida
Regional Director, The Wilderness Society, Coral Gables, Florida

6.4 Results of Coordination

Written comments on the DEIS were received from the following Federal agencies: U.S. Departmentof Housing and Urban Development, U.S. Department of Commerce (National Marine Fisheries Service), U.S. Department of the Interior, U.S. Environmental Protection Agency (Region 4). State and local agencies responding to the DEIS include: Florida Department of Community Affairs (State Clearinghouse), Department of Environmental Protection, Florida Department of State - Division of Historical Resources (SHPO), Florida Game and Fresh Water Fish Commission, Department of Health and Rehabilitative Services, Florida Department of Transportation, South Florida Water Management District, Treasure Coast Regional Planning Council, South Florida Regional Planning Council, City of Boca Raton, City of Delray Beach, Town of Palm Beach, Hillsboro Inlet District and Port Everglades. Individuals and interest groups responding include: Mr. Jim Koontz, Dr. Sanford F. Kurvin and the Beaches and Nearshore Habitats Initiative. Comment letters are shown in Appendix D or the FEIS. Responses to significant comments immediately follow the letter in which the comment was made.

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8.0 INDEX

Appendix A

PRELIMINARY
CLEAN WATER ACT, SECTION 404 (b) (1) EVALUATION

THE COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY REGION III

1. PROJECT DESCRIPTION

a. Location. The study area is located along the Atlantic Ocean shoreline of Palm Beach, Broward, and Dade Counties, Florida.

b. General Description. The study involves investigating coastal processes along the state's coastline on a regional basis. This study involves only region III, which includes Palm Beach, Broward, and Dade Counties.

c. Authority and Purpose. The project was authorized by Section 104 of Public Law (PL) 98-360, and a resolution dated 8 August, 1984, by the Committee on Public Works and Transportation of the U. S. House of Representatives. The purpose of this study is to provide recommendations regarding modifications for existing federal shore protection and navigation projects.

d. General Description of Dredged or Fill Material.

(1) General Characteristics of Material. The available borrow material that is suitable for beach nourishment is predominantly fine to medium grained quartz sand with varying amounts of whole and broken shell, and an average silt content of less than 10 percent in Palm Beach County and Broward County, becoming predominantly shell fragments with lesser amounts of fine quartz sand in Dade County.

(2) Quantity of Material. The quantity of sand needed for beach renourishment is 26,253,000 cubic yards for Palm Beach County; 39,243,000 cubic yards for Broward County; and 11,936,000 cubic yards for Dade County. Quantities available from nearby offshore borrow sites are estimated at 655,025,947 cubic yards in Palm Beach County; 28,658,188 cubic yards in Broward County; and 3,500,000 cubic yards in Dade County.

(3) Source of Material. The beach-quality material will be dredged from sand deposits between two offshore reefs which run parallel to the shoreline, and from sand transfer plants located on the north side of various inlets. There is sufficient sand in Palm Beach County to satisfy the renourishment requirements. Offshore borrow deposits in Broward and Dade Counties will have to be supplemented. There are two possible sources of alternate renourishment sand; upland quartz sand quarries from Ortona, Florida near Lake Okeechobee, and sand from the Bahama Banks.

e. Description of the Proposed Discharge Sites.

(1) Location. The discharge sites are various segments of beach and near offshore berms that span from DNR monument 13 at Jupiter Inlet in Palm Beach County, to DNR monument 113 at Key Biscayne in Dade County.

(2) Size. Region III of the Coast of Florida has 93 miles of shoreline (beaches), of which 61 miles have been authorized as part of Federal shore protection projects.

(3) Type of Site. The project site is a sand beach.

(4) Type of Habitat. The habitat consists of a carbonate and quartz sand beach.

(5) Timing and Duration of Discharge. The period of construction for the various stretches of beach will be dependent on funding and authorization, but will stretch over several years due to the magnitude of the various segments of beach to be renourished and the number of berm segments to be constructed.

f. Description of Disposal Method. Disposal will be by discharge from a hopper or hydraulic pipeline dredge.

2. FACTUAL DETERMINATION

a. Physical Substrate Determination.

(1) Substrate Elevation and Slope. The top elevation of the design beach fill will be 7 feet (MLW) and the slope will be 1 on 20 from the berm toward the water, and then 1 on 30 to where it intersects the existing bottom.

(2) Sediment Type. The sediment is predominantly fine to medium grained quartz sand with varying amounts of shell.

(3) Dredge/Fill Material Movement. The fill material will be subject to erosion by waves with the net movement of fill material to the south.

(4) Physical Effects on Benthos. Some benthic organisms will be buried by the fill. Most organisms in this high wave energy ecosystem are adapted for existence in an area with considerable substrate movement, thus, most will be able to burrow up through the fill material. Recolonization will occur within a year.

b. Water circulation, Fluctuation and Salinity Determination.

(1) Water. The placement of fill on the beach will increase turbidity in the nearshore area. Because the immediate nearshore area is a high wave energy system and subject to naturally occurring elevated turbidity, increases due to the project will not be significant. Fill placement will not have long-term or significant impacts, if any, on salinity, water chemistry, clarity, color, odor, taste, dissolved gas levels, nutrients or eutrophication.

(2) Current Patterns and Circulation. Currents in the project area are both tidal and longshore. Net movement of water due to the longshore current is from the north to the south. Placement of the fill on the beach will have no effect on the currents.

(3) Normal Water Level Fluctuations and Salinity Gradients. Tides in the project area are semi-diurnal. The mean tidal range at the Fort Pierce Inlet is 3.0 feet. Salinity is that of ocean water. Fill placement will not affect normal tide fluctuations or salinity.

c. Suspended Particulate/Turbidity Determinations.

(1) Expected Changes in Suspended Particulates and Turbidity Levels in the Vicinity of the Disposal Site. There will be a temporary increase in turbidity levels in the project area during discharge. Turbidity will be short-term and localized and no significant adverse impacts are expected. State standards for turbidity will not be exceeded.

(2) Effects on the Chemical and Physical Properties of the Water Column.

(a) Light Penetration. Light penetration will decrease during discharge in the immediate area where sand is being deposited on the beach. This effect will be temporary and will have no adverse impact on the environment.

(b) Dissolved Oxygen. Dissolved oxygen levels will not be altered by this project.

(c) Toxic Metals, Organics, and Pathogens. No toxic metals, organics, or pathogens will be released by the project.

(d) Aesthetics. Aesthetic quality will be reduced during that period when work is occurring. There will be long term increase in aesthetic quality of the beach once the work is completed.

(3) Effects on Biota.

(a) Primary Productivity and Photosynthesis. Primary productivity is not a recognized, significant phenomenon in the surf zone, where a temporarily increased level of suspended particulates will occur. There will be no effect on the near shore productivity as a result of the proposed beach disposal.

(b) Suspension/Filter Feeders. There will be no long-term adverse impact to suspension/filter feeders.

(c) Sight Feeders. There will be no long-term adverse impact to sight feeders.

d. Contaminant Determinations. Deposited fill material will not introduce, relocate, or increase contaminants.

e. Aquatic Ecosystem and Organism Determinations. The fill material that will be placed on the beach will consist of quartz and carbonate sand that is similar enough to the existing substrate so that no impacts are expected.

(1) Endangered and Threatened Species. There will be no significant impacts on any threatened or endangered species or on designated Critical Habitat of any threatened or endangered species. Sea turtle nesting may occur in the project area during the time dredging and beach disposal takes place. If construction takes place during the nesting season, a nest relocation program will be implemented as recommended by the USFWS. Manatee protection measures as specified by the USFWS will be followed to minimize the potential for harm.

(2) Hardbottom Habitat. Beach nourishment activities within the study area would cover approximately 31, 25, and 5 acres of nearshore hardbottom habitat in Palm Beach, Broward, and Dade counties respectively.

f. Proposed Disposal Site Determinations.

(1) Mixing Zone Determination. The fill material will not cause unacceptable changes in the mixing zone specified in the Water Quality Certification in relation to: depth, current velocity, direction and variability, degree of turbulence, stratification, or ambient concentrations of constituents.

(2) Determination of Compliance with Applicable Water Quality Standards. Because of the inert nature of the fill material, State water quality standards will not be violated.

(3) Potential Effects on Human Use Characteristics.

(a) Municipal and Private Water Supplies. No municipal or private water supplies will be impacted by the implementation of the project.

(b) Recreational and Commercial Fisheries. Recreational and commercial fisheries will not be impacted by the disposal of dredged material on the beach.

(c) Water Related Recreation. Water related recreation will be preserved and enhanced by the nourishment of the beach.

(d) Aesthetics. The stabilization of an eroding beach will improve aesthetics.

(e) Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves. The COFS will directly affect the J.U. Lloyd State Park. A 2.3 mile section of beach between R-86 and R-98 has already been restored through nourishment, with a periodic renourishment interval of 6 years. Biological monitoring of the J.U. Lloyd Beach Renourishment of 1989 reveal that although major faunal shifts have occurred in the softbottoms of the toe of fill site of the J. U. Lloyd State Park, no pattern of hardground organism abundance relative to dredge or fill activities was observed (Dodge *et al.*, 1991). Coordination with the Ranger of the J.U. Lloyd State Park reveal that beach nourishment was badly needed to combat erosion near the parking areas (Leve, 1995). Therefore, significant direct or indirect adverse impacts associated with the proposed combination of alternatives are not expected. No other State Park or aquatic preserves would be directly or indirectly impacted by COFS.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. There will be no cumulative impacts that result in a major impairment of water quality of the existing aquatic ecosystem as a result of the placement of fill at the project site. Subsequent maintenance dredging of beach-quality material from the entrance channel will occur approximately every other year. The impact of disposing material on the beach during these dredging cycles will be minor.

h. Secondary Effects on the Aquatic Ecosystem. No adverse secondary effects of the placement of the fill material are anticipated.

3. FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE.

a. No significant adaptations of the guidelines were made relative to this evaluation.

b. No practicable alternative exists which meets the study objectives that does not involve discharge of fill into waters of the United States.

c. The discharge of fill materials will not cause or contribute to, after consideration of disposal site dilution and dispersion, violations of any applicable State water quality standards for Class III waters. The discharge operation will not violate the toxic Effluent Standards of Section 307 of the Clean Water Act.

d. The disposal of dredged material on the beach will not jeopardize the continued existence of any species listed as threatened or endangered under the Endangered Species Act, or result in the likelihood of destruction or adverse modification of any Critical Habitat as specified by the Act.

e. The placement of full material will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreational and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. Life stages of aquatic species and other wildlife will not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values will not occur.

f. On the basis of the guidelines, the proposed disposal site for the discharge of dredged material is specified as complying with the requirements of these guidelines.

g. The placement of fill material complies with the specified protection measures for marine sanctuaries designated by the Marine Protection, Research, and Sanctuaries Act of 1972. No steps were necessary to minimize potential impacts of the discharge on aquatic resources.

Appendix B

FLORIDA COASTAL ZONE MANAGEMENT PROGRAM
FEDERAL CONSISTENCY EVALUATION

BEACH RENOURISHMENT
THE COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY
REGION III

1. CHAPTER 161, BEACH AND SHORE PRESERVATION

The intent of the coastal construction permit program established by this chapter is to regulate construction projects located seaward of the line of mean high water and which might have an effect on natural shoreline processes. Also, the project must be consistent with any beach and inlet management plans.

RESPONSE: Section 404 (r) of the Clean Water Act states that any discharge resulting from a federally approved construction project authorized by Congress is not subject to 404 regulation, or any State program approved under Section 404 of the Clean Water Act, if information on the effects of the discharge are included in the environmental impact statement (EIS) of the project, and if the EIS has been submitted prior to actual discharge and prior to either authorization or appropriation of construction. The proposed project, as discussed in Beach Erosion Control Projects Environmental Impact Statements for Palm Beach and Dade counties, and the Environmental Assessment for Broward County, meets all criteria for an exemption from regulation by the State of Florida under the provisions of Section 404 (r) of the Clean Water Act (PL 92-500, as amended). However, all attempts to obtain a State Water Quality Certificate will be made.

2. CHAPTERS 186 AND 187, STATE AND REGIONAL PLANNING

These chapters establish the State Comprehensive Plan which sets goals that articulate a strategic vision of the State's future. Its purpose is to define, in a broad sense, goals and policies that provide decisions-makers directions for the future, and provide long-range guidance for an orderly social, economic, and physical growth.

RESPONSE: The proposed project has been coordinated with the agencies of the State of Florida. Issues raised by the State have been addressed, and studies requested have been performed and discussed in Supplements to the Beach Erosion Control Projects Environmental Impact Statements for Palm Beach and Dade counties, and the Environmental Assessment for Broward County.

3. CHAPTER 252, DISASTER PREPARATION, RESPONSE AND MITIGATION

This chapter creates a state emergency management agency, with the authority to provide for the common defense; to protect the public peace, health and safety; and to preserve the lives and property of the people of Florida.

RESPONSE: The proposed disposal of sand on the various reaches of beaches will help protect upland development from erosion and reduce damage resulting from storms. Therefore, this project would be consistent with the efforts of Division of Emergency Management.

4. CHAPTER 253, STATE LANDS

This chapter governs the management of submerged state lands and resources within state lands. This includes archeological and historical resources; water resources; fish and wildlife resources; beaches and dunes; submerged grass beds and other benthic communities; swamps, marshes and other wetlands; mineral resources; unique natural features; submerged lands; spoil islands; and artificial reefs.

RESPONSE: The loss of any of the above resources that are deemed significant will be mitigated.

6. CHAPTER 258, STATE PARKS AND AQUATIC PRESERVES

This chapter authorizes the State to manage State parks and preserves. Consistency with this statute would include consideration of projects that would directly or indirectly adversely impact park property, natural resources, park programs, management or operations.

RESPONSE: The COFS will directly affect the J.U. Lloyd State Park. A 2.3 mile section of beach between R-86 and R-98 has already been restored through nourishment, with a periodic renourishment interval of 6 years. Biological monitoring of the J.U. Lloyd Beach Renourishment of 1989 reveal that although major faunal shifts have occurred in the softbottoms of the toe of fill site of the J. U. Lloyd State Park, no pattern of hardground organism abundance relative to dredge or fill activities was observed (Dodge *et al.*, 1991). Coordination with the Ranger of the J.U. Lloyd State Park reveal that beach nourishment was badly needed to combat erosion near the parking areas (Leve, 1995). Therefore, significant direct or indirect adverse impacts associated with the proposed combination of alternatives are not expected. No other State Park or aquatic preserves would be directly or indirectly impacted by COFS.

7. CHAPTER 267, HISTORIC PRESERVATION

This chapter establishes the procedures for implementing the Florida Historic Resources Act responsibilities.

RESPONSE: The COFS has been coordinated with the Florida State Historic Preservation Officer (SHPO). Archival research and magnetometer surveys of borrow areas have been conducted for projects which have been constructed and for some proposed projects. Where potentially significant magnetic anomalies have been identified in the borrow areas, buffer zones have been established to protect the anomalies from the effects of borrow area dredging. On those projects, the SHPO concurred with the District's determination that significant cultural resources would not be adversely affected if anomalies were protected by buffer zones. For borrow areas which have not been previously used or subjected to a cultural resource survey, the District will conduct a magnetometer survey and will coordinate the results of those surveys with the SHPO. The COFS is consistent with this chapter.

8. CHAPTER 288, ECONOMIC DEVELOPMENT AND TOURISM

This chapter directs the State to provide guidance and promotion of beneficial development through encouraging economic diversification and promoting tourism.

RESPONSE: The proposed project would provide a net economic benefit to the local and regional economy. The project will be cc ···ith economic diversification and tourism for the area, and therefore would be consistent \ .. goals of this chapter.

9. CHAPTERS 334 AND 334, PUBLIC TRANSPORTATION

This chapter authorizes the planning and development of a safe, balanced and efficient transportation system.

RESPONSE: No public transportation systems would be impacted by this project.

10. CHAPTER 370, SALTWATER LIVING RESOURCES

This chapter directs the State to preserve, manage and protect the marine, crustacean, shell and anadromous fishery resources in state waters; to protect and enhance the marine and estuarine environment; to regulate fishermen and vessels of the State engaged in the taking of such resources within or without State waters; to issue licenses for the taking and processing products of fisheries; to secure and maintain statistical records of the catch of each species; and, to conduct scientific and economic studies and research.

RESPONSE: The project will temporarily alter some habitats utilized by marine, crustacean, shell, and finfish fishery resources. The beach nourishment will create a larger, more suitable area for sea turtle nesting. Manatee protection measures will be implemented to ensure no adverse effects. The loss of seagrass and non-vegetated soft-bottom habitats will be mitigated. Based on the overall impacts of the project, the project appears to be consistent with the goals of this chapter.

11. CHAPTER 372, LIVING LAND AND FRESHWATER RESOURCES

This chapter establishes the Game and Freshwater Fish Commission, and directs it to manage freshwater aquatic life and wild animal life and their habitat to perpetuate a diversity of species with densities and distributions which provide sustained ecological, recreational, scientific, educational, aesthetic, and economic benefits.

RESPONSE: The proposed project has been coordinated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service for compliance with Section 7 of the Endangered Species Act. The potential effects of this project on threatened or endangered species is discussed in the Beach Erosion Control Projects Environmental Statements for Palm Beach and Dade counties, and the Environmental Assessment for Dade County. There will be some significant displacement of biological communities in some locations. Locations where significant habitat is lost or altered will be mitigated. Therefore, the project would comply with the goals of this chapter.

12. CHAPTER 373, WATER RESOURCES

This chapter provides the authority to regulate the withdrawal, diversion, storage, and consumption of water.

RESPONSE: This project does not involve water resources as described by this chapter.

13. CHAPTER 376, POLLUTANT SPILL PREVENTION AND CONTROL

This chapter regulates the transfer, storage, and transportation of pollutants and the cleanup of pollutant discharges.

RESPONSE: This project does not involve the transportation or discharging of pollutants.

14. CHAPTER 377, OIL AND GAS EXPLORATION AND PRODUCTION

This chapter authorizes the regulation of all phases of exploration, drilling, and production of oil, gas, and other petroleum products.

RESPONSE: This project does not involve the exploration, drilling or production of gas, oil, or petroleum products, and therefore does not apply.

15. CHAPTER 380, ENVIRONMENTAL LAND AND WATER MANAGEMENT

This chapter establishes criteria and procedures to assure that local land development decisions consider the regional impact nature of proposed large-scale development.

RESPONSE: The proposed project will provide a net economic benefit to the local and regional economy. Beach disposal of sand on the various reaches of beach may enhance tourism, and provide protection of beachfront properties from wave action and storm surges. The proposed project will be consistent with the goals of this chapter.

16. CHAPTER 388, ARTHROPOD CONTROL

This chapter provides for a comprehensive approach for abatement or suppression of mosquitoes or other pest arthropods within the state.

RESPONSE: The project would not further the propagation of mosquitoes or other pest arthropods.

17. CHAPTER 403, ENVIRONMENTAL CONTROL

This chapter authorizes the regulation of pollution of the air and waters of the state by the DER.

RESPONSE: The Federal Section 404 (r) exemption would apply to all aspects of the project. FDER has provided input into the preparation of the EISs and the EA. These documents discuss potential impacts of the project on water quality. Therefore, the project will comply with the intent of this chapter.

18. CHAPTER 582, SOIL AND WATER CONSERVATION

This chapter establishes policy for the conservation of the State soil and water through the Department of Agriculture. Land use policies will be evaluated in terms of their tendency to cause or contribute to soil erosion or to conserve, develop, and utilize soil and wter resources both on-site or in adjoining properties affected by the project. Particular attention will be given to projects on or near agricultural lands.

RESPONSE: The proposed project is not located near or on agricultural lands; therefore, this chapter does not apply.

Appendix C

SCOPING LETTER AND RESPONSES

STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS

2740 CENTERVIEW DRIVE • TALLAHASSEE, FLORIDA 32399-2100

LAWTON CHILES
Governor

LINDA LOOMIS SHELLEY
Secretary

December 20, 1994

Mr. A. J. Salem
Chief, Planning Division
Department of the Army
Corps of Engineers
Jacksonville District
Post Office Box 4970
Jacksonville, Florida 32232-0019

RE: Beach Erosion Control Projects - Scoping Letter for Draft Environmental Impact Statement - Region III, Coast of Florida Erosion and Storm Effects Study - Florida
SAI: FL9411141142C

Dear Mr. Salem:

The Florida State Clearinghouse, pursuant to Presidential Executive Order 12372, Governor's Executive Order 93-194, the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended, and the National Environmental Policy Act, 42 U.S.C. §§ 4321, 4331-4335, 4341-4347, as amended, has coordinated a review of the above-referenced project.

The Department of State (DOS) notes that numerous prehistoric and historic sites are located within the region included in the above-referenced study. The nature and location of the proposed activities may affect these significant archaeological or historic sites. Therefore, the applicant is required to provide the DOS with detailed information, as specified by DOS, when the individual projects are identified. The applicant is encouraged to continue coordination with the DOS and to fully comply with any conditions stipulated by the DOS, following its review of future project proposals. Please refer to the enclosed DOS comments.

Although the applicant did not provide a federal consistency determination in accordance with the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended, and its implementing regulations, 15 CFR 930, the state has determined that, at this stage, the above-referenced study is consistent with the Florida Coastal Management Program (FCMP). All subsequent environmental documents prepared for this project will be reviewed to determine the project's continued consistency with the FCMP. Such documents must be submitted to the Florida State Clearinghouse for interagency review. The state's continued concurrence with the project will be based, in part, on the adequate resolution of the issues identified during earlier reviews.

Very truly yours,

Linda Loomis Shelley
Secretary

LLS/rk

Enclosures

cc: George Percy, Department of State

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DEC 15 1994

IGA

FLORIDA DEPARTMENT OF STATE
Jim Smith
Secretary of State
DIVISION OF HISTORICAL RESOURCES
R.A. Gray Building
500 South Bronough
Tallahassee, Florida 32399-0250
Director's Office (904) 488-1480
Telecopier Number (FAX) (904) 488-3353

December 14, 1994

Ms. Janice L. Hatter, Director
State Clearinghouse
Executive Office of the Governor
Room 1603, The Capitol
Tallahassee, FL 32399-0001

In Reply Refer To:
Laura A. Kammerer
Historic Preservationist Supervisor
(904) 487-2333
Project File No. 944111-

RE: Cultural Resource Assessment Request
SAI# FL9411141142C
US Army Corps of Engineers
Region III of the Coast of Florida Erosion and Storm Effects Study - Draft Environmental Impact Statement
Broward, Dade and Palm Beach Counties, Florida

Dear Ms. Hatter:

This office reviewed this project for the Corps of Engineers and sent a letter December 8, 1994. We had the following comments:

The study region contains hundreds of historic shipwrecks. They are most frequently located in 20 feet or less of water, or in association with the first and second reef lines along the southeastern coast of Florida. We suggested that the Corps contact several local agencies regarding local shipwreck information and provided a contact person and telephone number.

There are also hundreds of prehistoric and historic archaeological sites in this coastal region. A current Florida Master Site File printout of properties in Broward, Dade and Palm Beach Counties listed, or eligible for listing in the *National Register of Historic Places* was provided to the Corps.

The following proposed modifications for existing shore protection and navigation projects are likely to affect historic shipwrecks: sand bypassing at inlets using conventional dredging, construction of groins and/or offshore breakwaters, construction of sand traps and offshore borrowing. In addition, the following types of activities are likely to affect upland prehistoric and historic properties: dune construction and upland sand borrow sources.

As with all of the Corps shore protection and navigation projects, the above activities may have to be coordinated on a case-by-case basis with this office. We will be working with the Corps and providing more specific concerns and information regarding important cultural resources as projects are developed and implemented.

The project is consistent with the historic preservation aspects of Florida's Coastal Management Program. If you have any questions concerning our comments, please do not hesitate to contact us.

Sincerely,

Laura R. Kammerer

for George W. Percy, Director
Division of Historical Resources
and
State Historic Preservation Officer

GWP/Klk
xc: Jasmin Raffington, FCMP-DCA

DATE: 11/18/94

COUNTY: BROWARD

COMMENT DUE DATE: 12/02/94

SAI#: [redacted]114[redacted]

STATE AGENCIES

- ___ Agriculture
- ___ Board of Regents
- ___ Commerce
- _X_ Community Affairs
- ___ Education
- _X_ Environmental Protection
- _X_ Game & Fish Comm
- ___ Health & Rehab Srv
- ___ Highway Safety
- ___ Labor & Employmnt
- ___ Law Enforcement
- _X_ Marine Fish Comm
- ___ State Library
- _X_ State
- _X_ Transportation
- ___ Trans Disad. Comm
- ___ DEP District

LOCAL/OTHER

- ___ NWFWMD
- _X_ SFWMD
- ___ SWFWMD
- ___ SJRWMD
- ___ SRWMD

OPB POLICY UNITS

- ___ Public Safety
- ___ Education
- _X_ Environment/C & ED
- ___ General Government
- ___ Health & Human Srv
- ___ Revenue & Eco. Ana
- ___ SCH
- _X_ SCH/CON

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OFFICE OF
Intergovernmental Programs

The attached document requires a Coastal Zone Management Act/Florida Coastal Management Program consistency evalutation and is categorized as one of the following:

___ Federal Assistance to State or Local Government (15 CFR 930, Subpart F). Agencies are required to evaluate the consistency of the activity.

_X_ Direct Federal Activity (15 CFR 930, Subpart C). Federal Agencies are required to furnish a consistency determination for the State's concurrence or objection.

___ Outer Continental Shelf Exploration, Development or Production Activities (15 CFR 930, Subpart E). Operators are required to provide a consistency certification for state concurrence/objection.

___ Federal Licensing or Permitting Activity (15 CFR 930, Subpart D). Such projects will only be evaluated for consistency when there is not an analogous state license or permit.

FOR CONSISTENCY PROJECTS, SEE REVERSE SIDE FOR INSTRUCTIONS.

To: **State Clearinghouse**
Executive Office of the Governor -OPB
Room 1603, The Capitol
Tallahassee, FL. 32399-0001
(904) 488-8114 (SC 278-8114)

Florida Coastal Management Director
Department of Community Affairs
Suite 305, Rhyne Building
Tallahassee, FL. 32399-2100
(904) 922-5438 (SC 292-5438)

EO. 12372/NEPA

- ☐ No Comment
- ☐ Comments Attached
- ☒ Not Applicable

Federal Consistency

- ☐ No Comment/Consistent
- ☐ Consistent/Comments Attached
- ☐ Inconsistent/Comments Attached
- ☒ Not Applicable

DEP is co-sponsor

From:
Division/Bureau: Department of Environmental Protection
Office of Intergovernmental Programs
Reviewer: Carliane D. Johnson
Date: Nov. 23, 1994

DATE: 11/18/94
COMMENT DUE DATE: 12/02/94
SAI#: FL9411141142C

COUNTY: BROWARD

STATE AGENCIES		LOCAL/OTHER		OPB POLICY UNITS	
___	Agriculture	___	NWFWMD	___	Public Safety
___	Board of Regents	_X_	SFWMD	___	Education
___	Commerce	___	SWFWMD	_X_	Environment/C & ED
_X_	Community Affairs	___	SJRWMD	___	General Government
___	Education	___	SRWMD	___	Health & Human Srv
_X_	Environmental Protection	___		___	Revenue & Eco. Ana
_X_	Game & Fish Comm	___		___	SCH
___	Health & Rehab Srv			_X_	SCH/CON
___	Highway Safety				
___	Labor & Employmnt				
___	Law Enforcement				
_X_	Marine Fish Comm				
___	State Library				
_X_	State				
_X_	Transportation				
___	Trans Disad. Comm				
___	DEP District				
___					
___					

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MARINE FISHERIES COMMISSION

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(904) 922-5438 (SC 292-5438)

EO. 12372/NEPA

☐ No Comment
☐ Comments Attached
☐ Not Applicable

Federal Consistency

☐ No Comment/Consistent
☐ Consistent/Comments Attached
☐ Inconsistent/Comments Attached
☒ Not Applicable

From:
Division/Bureau: Marine Fisheries Comm
Reviewer: Ray W. Moore
Date: 11-28-94

DATE: 11/18/94

COUNTY: BROWARD

COMMENT DUE DATE: 12/02/94

SAI#: FL941114[illegible]

STATE AGENCIES	
___	Agriculture
___	Board of Regents
___	Commerce
_X_	Community Affairs
___	Education
_X_	Environmental Protection
_X_	Game & Fish Comm
___	Health & Rehab Srv
___	Highway Safety
___	Labor & Employmnt
___	Law Enforcement
_X_	Marine Fish Comm
___	State Library
_X_	State
_X_	Transportation
___	Trans Disad. Comm
___	DEP District
___	
___	

LOCAL/OTHER	
___	NWFWMD
_X_	SFWMD
___	SWFWMD
___	SJRWMD
___	SRWMD
___	
___	

OPB POLICY UNITS	
___	Public Safety
___	Education
_X_	Environment/C & ED
___	General Government
___	Health & Human Srv
___	Revenue & Eco. Ana
___	SCH
_X_	SCH/CON

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NOV 21 1994
OFFICE OF
Intergovernmental Programs

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To: **State Clearinghouse**
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EO. 12372/NEPA

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- ☐ Comments Attached
- ☒ Not Applicable

Federal Consistency

- ☐ No Comment/Consistent
- ☐ Consistent/Comments Attached
- ☐ Inconsistent/Comments Attache
- ☒ Not Applicable

DEP is co-sponsor

From:

Division/Bureau: Department of Environmental Protection, Office of Intergovernmental Programs

Reviewer: Carliane D. Johnson

Date: Nov. 23, 1994

APPENDIX 3

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

FORM
STATE TRANSPORTATION

INTERGOVERNMENTAL COORDINATION AND REVIEW
ROUTING SHEET

DATE: 11/22/94

TO: Norm Feder, D1; Aage Schroder, D2; Marvin Stukey, D3; [redacted] Jim Kimbl
D5: Servando Parapar, D6; David Twiddy, D7; B. Ashbaker, [redacted], Hebert, WISE

SAI#: FL 94 11 41 42 C

Application Transmitted: Atlantic Coastline

Date Response Due to the Clearinghouse: 12/02/94

Please review and comment regarding the attached application in accordance with Department Procedure 525-010-205-b. A letter of response to the Director of the Clearinghouse and this routing sheet should be compl and returned as directed in the procedure.

The following criteria, as appropriate to the project, should be used to evaluate the application and develop your comments:

- Florida Transportation Plan
- Adopted Work Program
- Transportation Improvement Plan (TIP)
- Right of Way Preservation and Advanced Acquisition
- Transit Development Program
- MPO Comprehensive Transportation Plan and 20 year Transp
- Florida Rail System Plan
- Florida Aviation System Plan
- Local Airport Master Plan
- Florida Seaport Mission Plan
- Environment Commitments
- Unified Planning Work Program
- Level of Service
- Access Management

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Environmental
Management Office

If comments are warranted based on other criteria, they should be included.

Work Program Item Number: ________________ (if applicable).

RONNICE S. VAUGHN
Central Office ICAR Coordinator - MS /28

TYPE: General Aviation Rail Seaports
Transit

South
Florida
Regional
Planning
Council

December 14, 1994

Mr. A. J. Salem
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019

RE: SFRPC #94-1121, Request for comments on alternatives to beach erosion to be included in *The Coast of Florida Erosion and Storm Effects Study* by the Army Corps of Engineers, Palm Beach, Broward and Dade Counties.

Dear Mr. Salem:

We have reviewed the alternative described in your request for information in reference to the above study and have the following comments.

The decision to study the processes of shoreline erosion in a comprehensive manner is generally consistent with the mission of the South Florida Regional Planning Council, and staff supports this effort.

The agreed upon alternative course(s) of action to prevent or counteract erosion should be consistent with the goals and policies of the *Regional Plan for South Florida*, specifically the following:

GOAL 9.1	To reduce erosion rates and eliminate dune destruction in the Region and, where feasible, continue to rebuild destroyed dunes by 1995.
Policy 9.1.1	All construction within the coastal zone will, at a minimum, be limited by the state coastal construction control lines and all other applicable state and local laws.
Policy 9.1.2	Discourage all development in the Coastal High-Hazard Area (as delineated and adopted in each local government comprehensive plan) that will be subsidized through public moneys such as disaster insurance or infrastructure.
Policy 9.1.3	Discourage all development seaward of the Coastal Building Zone (defined in Chapter 161, F.S.) that is shown to have significant adverse impacts on the stability of the shoreline or is subject to severe erosion.
Policy 9.1.5	To resolve beach erosion problems caused by inlets, local governments, inlet management districts and port authorities should coordinate with the Florida Department of Natural Resources to ensure that inlet management plans incorporate systems which restore to downdrift beaches, on an annual basis, an amount of beach quality sand equivalent to the amount directly prevented from reaching the downdrift beach by the inlet and its associated jetties.

Policy 9.1.6 Dune walkovers will be built, where practical, at all beach access points, public and private, to prevent destruction of the dune system.

Policy 9.1.7 Where feasible, create buffer zones between landward development and the dune system so as to prevent further erosion of the dune system. This area will be planted in the native vegetation necessary for stabilization of the dune.

Policy 9.1.8 Dune revegetation or other forms of mitigation acceptable to the permitting agency will be used for necessary seawall construction.

Policy 9.1.9 Non-structural beach protection will be the preferred form of erosion control in the Region.

Policy 9.1.10 Encourage replacement of bulkheads and seawalls with non-structural forms of shoreline stabilization.

Policy 9.1.11 Areas will be designated as suitable for renourishment and rebuilding of lost dunes by local government. Designation should include consideration of the following:

a) potential impact on marine resources;

b) cost to public; and

c) life expectancy of stabilization project.

Policy 9.1.12 Permit bulkheading or construction of other hard shoreline stabilization structures in the coastal water bodies for the purpose of erosion control only if:

a) the construction is necessary to maintain navigational channels; or

b) there is severe loss of property due to erosion control structures on adjoining property; or

c) not stabilizing would mean significant loss to the property owners; or

d) this activity provides habitat enhancement; or

e) not stabilizing causes water quality problems due to turbidity; or

f) a sloped, vegetated revetment system is unlikely to provide adequate stabilization; or

g) the Department of Natural Resources approves the project if it is seaward of the coastal construction control line.

GOAL 9.3 To reduce discharges which degrade coastal water quality in the Region by 1995.

Policy 9.3.2 Turbidity control measures will be utilized in all phases of any construction in the coastal zone to prevent applicable violation of local, state, and federal water quality standards.

Policy 9.3.3	**The cumulative effects of construction in the coastal areas will be considered in the permitting processes, as well as individual effects.**
Policy 9.3.4	**The biological and hydrological functions of coastal wetlands and deep water habitats lost to development will be mitigated with creation of new habitat, restoration or enhancement of degraded habitats.**
GOAL 9.6	**To improve productivity of fisheries habitat by 1995.**
Policy 9.6.5	**Improve degraded habitats to a functional and productive state.**
Policy 9.6.6	**Activities which would degrade or eliminate any type of approved shellfish harvesting area classification shall be prohibited.**
GOAL 9.7	**Beginning now, prohibit destruction of coral habitat and achieve a no net loss of coral habitat.**
Policy 9.7.2	**Prohibit dredging of sand for beach renourishment projects and off-shore drilling for oil or gas in the vicinity of coral.**
Policy 9.7.5	**Review development and marine activities with regard to impact on near-shore bottom resources, including coral habitat, and condition their approval upon no net loss of historical coral habitat.**
Policy 9.7.6	**If mitigation is appropriate, it should be required for all lost coral habitat and it should consist of the creation of new habitat or enhancement of existing habitat similar to that which has been lost.**
Policy 9.7.9	**Federal, state, regional and local agencies should coordinate the development of resource protection plans and reviews of proposed development which may affect marine sanctuaries.**
GOAL 9.8	**Eliminate the net loss of native coastal vegetation in the Region, and where possible, restore destroyed habitat by the year 2000.**
Policy 9.8.1	**Activity causing adverse effects to the seagrass population of the Region will not be allowed unless:** **a) it is necessary to maintain existing navigational channels; and** **b) the activity is in the public interest and no other alternative exists.**
Policy 9.8.2	**Mangroves may be removed from the coastal area of the Region only if doing so is in the public interest and no other alternative exists.**
Policy 9.8.3	**If mitigation is appropriate, it should be required for all lost habitat, and will be in the creation of new habitat or enhancement of existing habitat of the same or similar species in a ratio of at least twice the size of the natural area lost, and as determined feasible for the specific habitat.**
Policy 9.8.4	**Areas for restoration and mitigation will be identified by the applicable governmental agency.**

Thank you for the opportunity to comment. We would appreciate being kept informed of the progress of this study.

Sincerely,

John E. Hulsey
Regional Planner

TOWN OF MANALAPAN
PALM BEACH COUNTY
600 SOUTH OCEAN BOULEVARD
MANALAPAN, FLORIDA 33462-3398
Telephone (407) 585-9477
Fax 407-585-9498

December 8, 1994

Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Attention Planning Division, Environmental Branch

Subject : The Coast of Florida Erosion and Storm Effects Study

To Whom It May Concern:

In response to your letter dated November 8, 1994, the Town of Manalapan submits the following information, data and comments.

The Town of Manalapan is located in Region III of the study area between DEP markers R-137 and R-151. The south boundary of the Town is adjacent to the South Lake Worth Inlet and the associated sand transfer pump on the north side of the Inlet.

All of the issues referenced in your letter have caused the Town grave concerns. We have expressed concern in the past and continue to question beach renourishment projects that include beach fill and continued inlet bypass sand pumping that fails to address the impact to the beaches north of the inlet.

We have addressed many of the issues, as outlined in your letter of November 8, 1994, with our reply to the letter from your Department dated December 7, 1993 concerning the Ocean Ridge segment of the Palm Beach County Shore Protection Project. Our reply dated December 30, 1993 should be in your Department file.

The Town believes that with the historical data available - the sand bypass pump at the South Lake Worth Inlet is the oldest inlet bypass pump in the State - the damage to the beaches north of the pump has been extensive and has not been fully evaluated. The Town's Engineering Department has accumulated approximately 5000 photographs starting from the construction period of the Inlet to the present time. Since 1965 photographic monitoring has occurred from various fixed locations from an area 5 miles north of the Inlet to 6000 feet south of the Inlet. The photographic documentation we have made available to the Corps should be taken into consideration before your study is completed.

During our research, one important problem has been the accuracy of available data. We have found most of the DEP data checked reasonably well with known and reliable local information with exception, that being the 1928 work taken from an aerial survey. For example, we noted that the DEP marker R-144 value is too far west by 102.5 feet, at marker R-145 it is too far west by 120.4 feet.

Also, we found somewhat less error in the Town of Ocean Ridge where the values were too far to the east. It appears that, at least in this area, the aerial survey is useless or that the values taken for the DEP data report were poorly done.

We have attached a brief historical outline of the South Lake Worth Inlet Sand Pump and recommendations for modifications to the pump and the Inlet that we hope will merit your consideration.

Sincerely,

Charles H. Helm
Town Manager

cc:

Honorable G. K. Shortz, Mayor
Honorable Peter Blum, Vice Mayor
Honorable William J. Graham, Jr., Mayor Pro Tem
Honorable James C. Grey, Commissioner
Honorable Robert E. Parlette, Jr., Commissioner
Honorable Edward I. Singer, Commissioner
Mr. James McC. Wearn, Town Attorney

SLWI SAND PUMP

The SLWI was opened in 1927. By 1930 the north shoreline had stabilized near the end of the short north jetty while the south shore line slowly receded. In 1931 the McCormick sea wall was completed along the original shore line starting at an existing bulkhead 900 feet south of the inlet and extending southward some 2200 feet with a group of 8 groins extending seaward.

The groins did not accrete sand as expected and in 1937 a small fixed dredge was mounted on the end of the north jetty discharging just south of the south jetty. During 1937/41 this 65 HP unit with a 6" pump transferred an average of 50,000 cu yds of sand per year. The rate was accurately measured by filling a crib at the discharge. This rate not only supplied the normal along shore drift but filled the shore line to nearly the top of the 14 foot MSL sea wall and broadened the beach beyond. This obviously was an amount greatly in excess of the along shore drift losses. By this time an ebb tidal shoal had formed transferring the main drift around the inlet to a normal off shore path some 3 or 4 thousand feet south of the inlet.

During the war 1942/4 the pump did not operate and again erosion occurred south of the inlet some 4000 feet. At the end of this period about 30 % of the fill remained, this equates to a beach drift loss rate of 26,923 cu yds /yr. A number of unknown variables such as direct loss due to the inlet, ebb tidal shoal formation, increased loss because of a wider than normal beach in 1941 and certainly poor data will somewhat alter this result but it is apparent the beach drift is a small part of the south drift, occurring 50 to 150 feet off shore, which must have been in excess of 200,000 cu yds/yr in this period of abundant sand.

Although it had been agreed to operate the dredge only to fill the groin field it was continued because of a threatened law suit and because it prevented some sand passing into the inlet around the end of the north jetty as well as supplying sand for an expanding south shore line. The system was measured at 170 cu yds/hr peak and averaged about 130 cu yds/hr.

In July 1947 a new sand pump installation was completed with a 250 HP engine and 8" pump and discharge line. The system could produce a peak of 240 cu yds/hr and averaged about 175 cu yds/hr. In January 1952 the plant was rebuilt with a 300 HP engine The peak transfer was measured at 270 cu yds/hr but average operation was 185 cu yds/hr. In 1967 a completely new plant was installed with a 400 HP engine and a 10" Georgia Iron Works pump and 10" discharge line. This system while larger in every way had a considerably lower pipeline velocity and generally produced 150 to 165 cu yds/hr in average operation. It was equipped with an atomic production monitor which closely tracked measurements made by velocity determination and percent of sand in the discharge line.

Pumping gradually increased to 105,000 cu yds/yr by 1962 and peaked at 206,600 cu yds in 1963 and together with 145,000 cu yds from Lake Worth the south shore line was built out 295 feet from the McCormick sea wall. Exhibit 2 . Soon after an apartment house was constructed some 65 feet eastward over the original sea wall, while north of the inlet two houses and several auxiliary structures gradually were undermined and fell into the ocean in 1963. The pump caused a recession of 55 feet at the north jetty, a maximum of 75 feet about 4000 ft north and 65 ft 14,000 ft north at the Manalapan town limits continuing for a considerable distance further north. In 1965 the north jetty was extended 335 feet eastward but the sand pump effective pumping area was only moved 60 feet eastward.

Sand only drifts when raised by water turbulence and moved by current flow. At the vicinity of the inlet the current necessarily must pass around the jetty end some 235 ft east of the sand pump location where little or no drift occurs. Thus the pump can not access the normal drift and simply digs a deep hole and the shore line collapses into the hole. A sand pump cannot skim the surface to pick up approaching drift, it is therefor necessary to provide a weir so the drifting sand can fall into a basin where the pump can operate well submerged. When the sand pumped exceeds the small along shore drift at any moment, shore line destruction results.

Another serious problem for the area is caused by the deep Lake Worth Inlet to the north where there is essentially no natural sand by passing. Here a sand pump with a long deeply submerged discharge line has operated off and on, and while variously estimated at 150, 175 and 200 cu yds per hour the amount verified by an atomic production monitor showed from 20 to 30 cu yds/hr which was consistent with discharge measurements conducted by Manalapan engineers.

While essentially the full southerly literal drift passes around the end of the SLWI jetties it does not return to the shore line via the transfer bar for a distance of some 4000 to 5000 feet south of the inlet. During flood tide a substantial portion of the drift goes in the inlet, part of which settles in the protected sand trap, a part enters and shoals the intercoastal canal and surrounding area the rest is swept out during ebb tide but joins that carried south by the transfer bar so that the first 4000 feet south of the inlet will be naturally deficient in littoral drift.

Repeated renourishment of this area has occurred many times in the recent past in 1961, 62, 63, 65, 67, 68, 69, 73 and most recently in 1989, about a thousand feet was renourished with 34,000 cu. ft. of sand only to be all lost in 6 months despite sand pump operation. Renourishment over the years from the flood shoal has amounted to 510,000 cu yds while pumping sand from the Manalapan beach has added 3,870,300. Clearly a beach here, in the inlet shadow, built out into the ocean can not be maintained without works to correct the extreme losses. The present sand pump is some 300 feet west of the principal path of the major natural sand transfer around the end of the north jetty where as much sand as possible should be recovered and shifted from the transfer bar to the immediate south beach.

While the long North jetty at the inlet has backed up sand some 4000 feet to the north in past 65 years, heavy recession has occurred from that point north mandating the investment of some $6,300,000 (1994 $) in sea walls to protect structures that were originally built more than 100 feet west of the shore line. This loss attributed to the sand pump operation was confirmed by an in-depth computer model study by the US Corps of Army Engineers in a similar proposed sand pump installation., in which it was determined that a sand pump would unacceptably damage the beach to the north. (Exh.3) Another serious loss in Manalapan occurs during the approximately 30% of the time of northerly drift when the north curved jetty and short south jetty causes the drift to be directed into the inlet during flood tide.

POSSIBLE SOLUTIONS

Obviously present procedures will not solve the problems north and south of the Inlet. It is necessary to by pass sand which may enter the inlet around the end of the north jetty. It is also necessary to find a solution to the shadow just south of the inlet where the natural sand transfer occurs around the end of the north jetty but does not reach shore for a distance of 4,000 to 5,000 feet. And it is necessary to eliminate the severe erosion in Manalapan north of the normal accretion fillet just north of the north jetty caused by the inshore sand pump removing sand not only below but west of the normal shore line.

At Boca Raton Inlet a weir at MLW near the end of the jetty allows drifting sand to spill into the inlet channel where it is pumped by a floating dredge to the near south shore. While the north shore line has receded to the weir location, erosion has been greatly reduced in the shadow zone just south of the inlet.

At Hillsboro Inlet a rock formation forms a north jetty quite similar to the SLWI and a natural weir near the end allows sand to spill into pockets near the channel where a small floating dredge transfers the sand accumulation to the immediate south shore. This arrangement also has worked well over the years to reduce the south shore erosion.

Both of these systems have the advantage of picking up not only the small beach drift but also a of the natural drift which occurs just seaward of the end of the north jetty some of which is portion carried behind the end of the jetty in heavy seas, a condition that can't occur at SLWI because the pump is located so far landward from the end of the jetty. Also both systems have some north shore damage but nothing like that at Manalapan.

SUGGESTED MODIFICATIONS

1. Complete the south jetty This will reduce the strong currents that run along the south shoreline and scour the beach area, and may improve the flood currents somewhat to reduce the loss of northerly drift to Manalapan.

2. Construct an underwater breakwater from a point on the south jetty south about 1000'. This will form a perched beach to stabilize and hold sand in the area built out in the ocean, or alternate works to prevent the unusual loss of sand in this area.

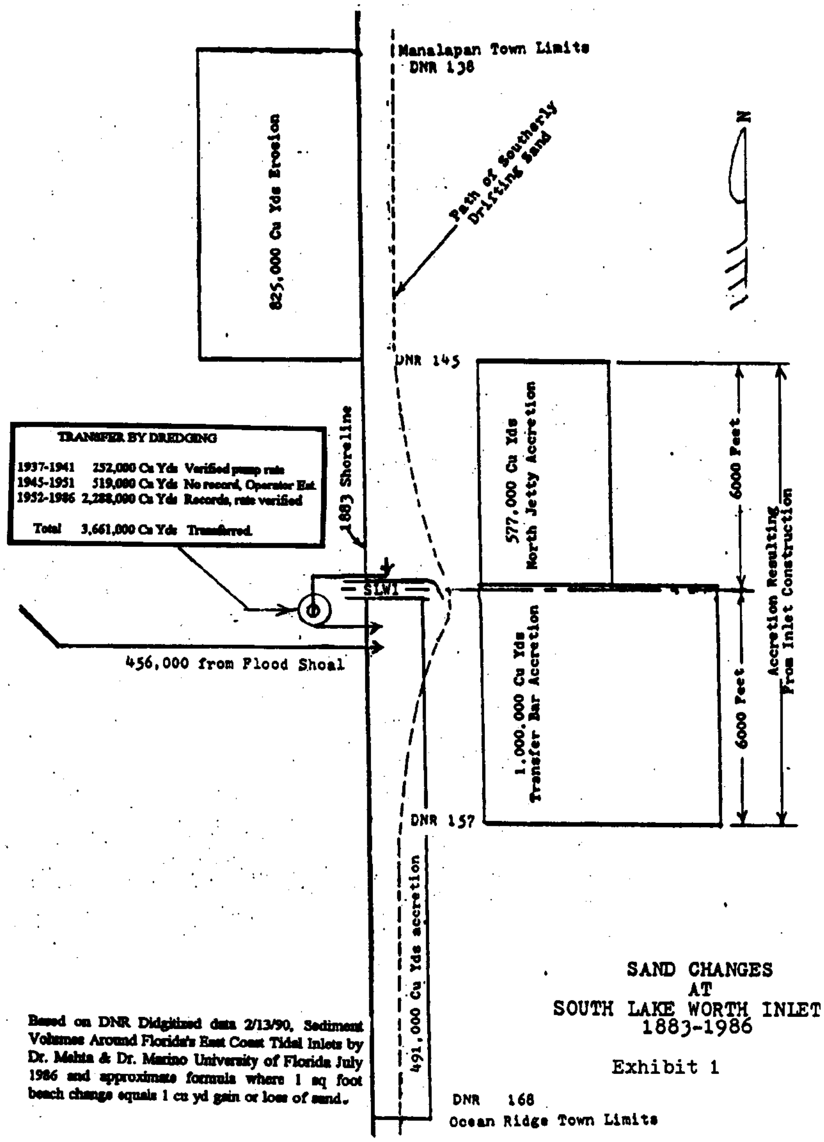
3. Construct a steel bulkhead at MLW inside the north jetty forming a retention basin in the outer end of the jetty and remove the rocks in the outer 50' of the jetty to MLW. Exhibit 4.

4. Remove the present pump suction and connect to two or three jet pumps in the basin at 3.

.5. Perform the present County plan for beach restoration.

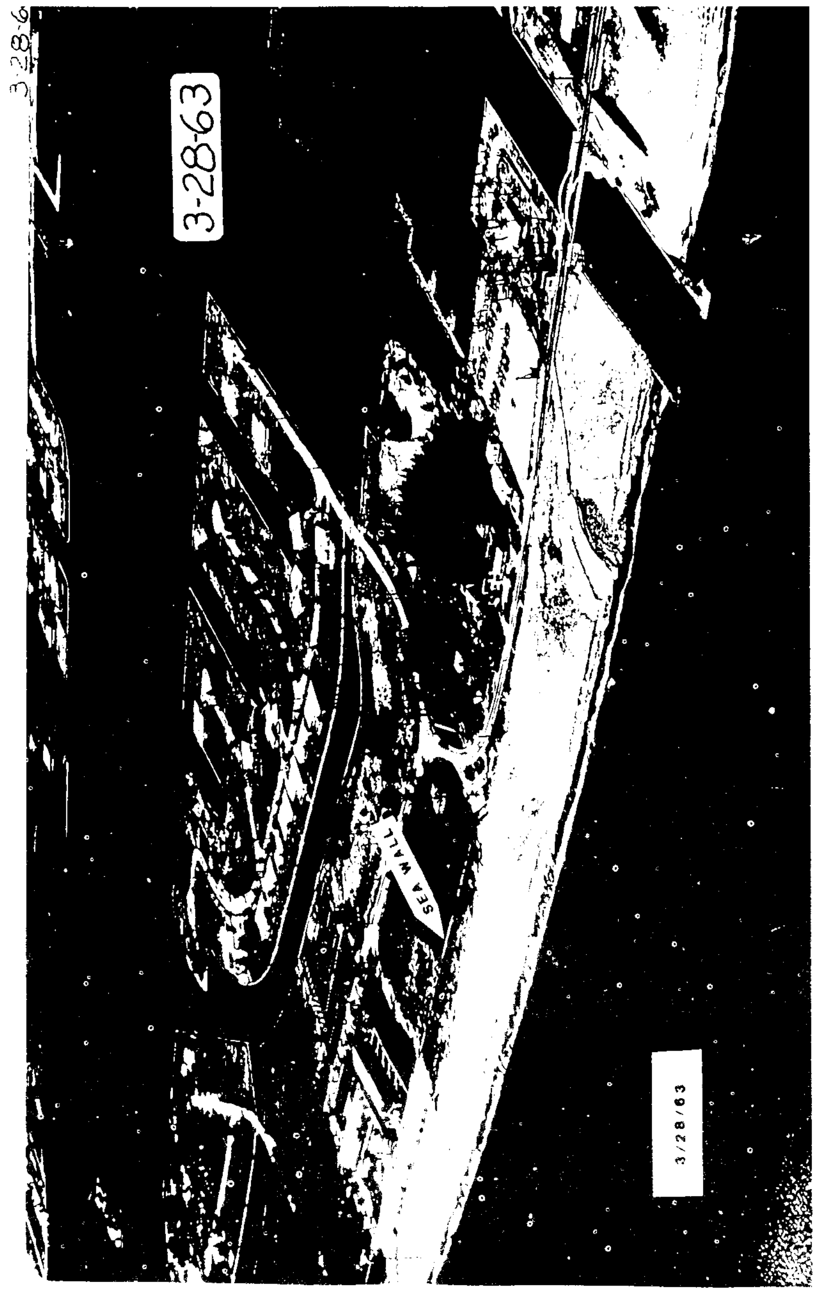
6. Provide a small dredge to frequently pump out the flood basin inside the inlet.

This arrangement will give access to a larger amount of the normal drift passing around the end of the north jetty and plus frequent pumping of the flood shoal inside the inlet should then supply sufficient sand to keep a beach in the protected south shore area. The guarded pump operation will do far less damage to the Manalapan beaches and it is hoped that some of the normal north drift will get by the inlet where it is now denied to Manalapan.



SAND CHANGES
AT
SOUTH LAKE WORTH INLET
1883-1986

Exhibit 1


3-28-63
SEA WALL
3/28/63

ENGINEERING APPLICATION
GENERALIZED MODEL FOR SIMULATING SHORELINE CHANGE
CANAVERAL HARBOR, FLORIDA

Ed Hodgens, P.E.
U.S. Army Corps of Engineers
Jacksonville District

ABSTRACT

This paper focuses on the use of the computer model GENESIS (Generalized model for Simulating Shoreline change) for evaluation of coastal processes in a highly active area of shoreline where little hard physical field data is available.

Coastal inlets have historically contributed to shoreline erosion and the navigation channel at Canaveral Harbor, Florida, may be responsible for a significant portion of the erosion of the beaches south of the inlet. In 1962, Congress authorized the construction of a sand bypass system to transfer littoral material around the harbor to mitigate erosion losses and reduce navigation maintenance.

A General Design Memorandum (GDM) was prepared in 1989 to address the mitigation of the effects of the port on down-drift erosion. The recommended plan included the construction of a fixed shore-based sand bypass system located north of the north jetty with the capability to bypass 106,000 cubic yards to the south beaches annually. Detailed design was subsequently initiated to determine the most effective location for the bypass system. However, there is extremely limited data upon which to base a detailed coastal engineering analysis of the anticipated sediment budgets by location. Also, the cape and offshore shoals create complex wave patterns along the immediate coast which makes simplified long, sandy coast evaluations inaccurate. It was decided to model the shoreline response to bypassing by using the GENESIS numerical model.

Initial modeling indicated that the recommended GDM plan would have adverse impacts on the beaches north of the inlet. The model was then used to evaluate two alternative methods of bypassing which included a movable shore-based jet pump system and conventional dredging of a nearshore borrow area.

Presented 2-11-93 at the Florida Shore and Beach Convention at St. Petersburg, Florida.

Exhibit 3

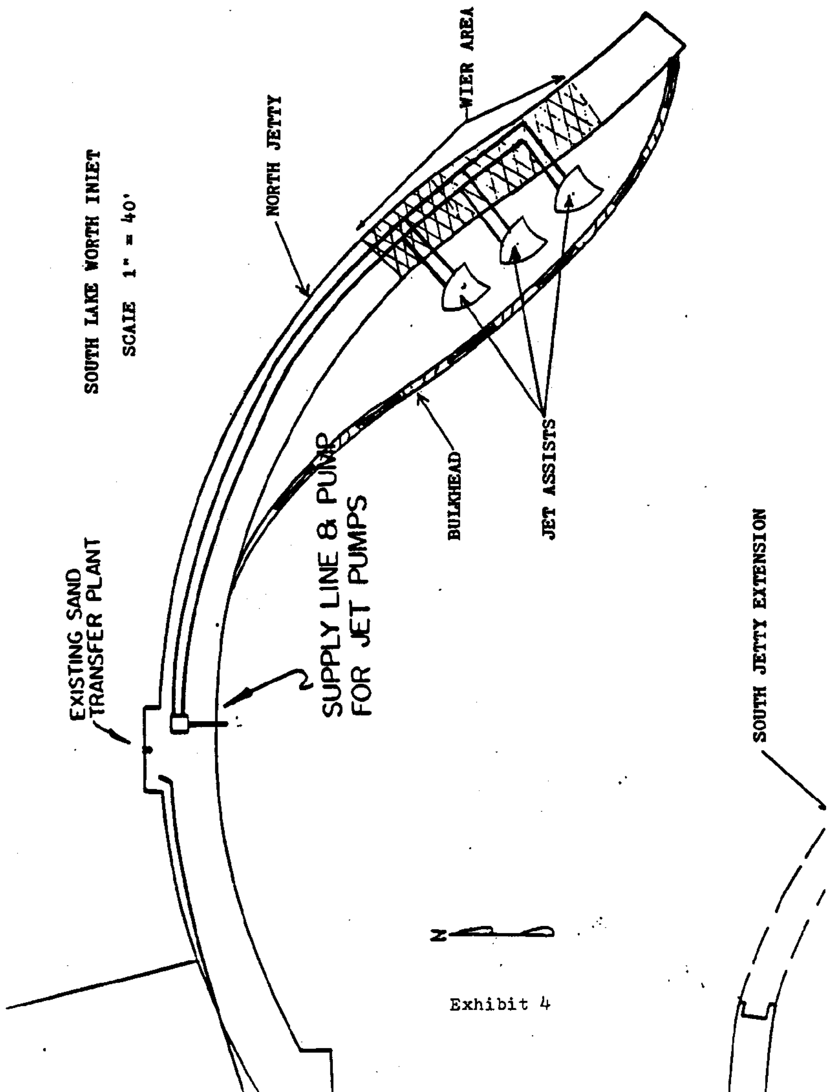

SOUTH LAKE WORTH INLET
SCALE 1" = 40'
NORTH JETTY
WIER AREA
JET ASSISTS
BULKHEAD
EXISTING SAND TRANSFER PLANT
SUPPLY LINE & PUMP FOR JET PUMPS
SOUTH JETTY EXTENSION
N

Exhibit 4

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, Florida 33702

December 7, 1994

Colonel Terry Rice
District Engineer, Jacksonville District
Department of the Army, Corps of Engineers
ATTN: Planning Division
Environmental Branch
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Colonel Rice:

The National Marine Fisheries Service has reviewed your staff's letter dated November 8, 1994, requesting information to help define issues and concerns to be addressed in a Draft Environmental Impact Statement (DEIS) for Region III of the Coast of Florida Erosion and Storm Effects Study.

Your list of alternatives being considered that will be addressed in the DEIS appear complete and we have no further suggestions. The DEIS should address possible impacts to living marine resources that may result from each of the alternatives and any mitigation options that may be available. We do request that seagrasses be included under your significant issues of concern list. Historic renourishment projects, particularly in Dade County, have impacted nearshore seagrass habitats and any future ones could as well.

We appreciate the opportunity to provide these comments. Please continue to coordinate with us as the DEIS becomes available. If you have any questions, please contact Mr. John Iliff of our Miami Field Office at 305/595-8352.

Sincerely,

W. Mark Thompson

for Andreas Mager, Jr.
Assistant Regional Director
Habitat Conservation Division

TOWN OF SURFSIDE

MUNICIPAL BUILDING
9293 HARDING AVENUE
SURFSIDE, FLORIDA 33154
(305) 861-4863

December 6, 1994

Department Of The Army
Jacksonville District
Corps of Engineers
Planning Division, Environmental Branch
P. O. Box 4970
Jacksonville, FL 32232-0019

Dear Sirs,

This letter is to respond to your request for comments with regards to the Coast of Florida Erosion and Storm Effects Study.

The Town of Surfside is very interested in this study since our beach erodes more severely than most. Because of this we urge the following:

1. The continued renourishment of existing projects unless a way is determined to halt the erosion of our beach.

2. The development of methods to retard or halt the erosion of sand from our beach.

3. Until there is no further need for renourishment, the use of Bahamian aragonite for this renourishment.

This last item is most imperative in light of how long the permitting process for renourishment with domestic sand currently takes. We feel that by using sand from the Bahamas, the length of time between funding and renourishment can be drastically reduced. In addition, extensive use of this source of sand may reduce the cost of barging it from the Bahamas to Florida, making it a financially attractive source of sand as well.

No matter the source of sand, a complete beachfront is essential on two fronts. First, a wide beachfront is a strong buffer against water damage from storms. A State of Florida, Division of Beaches and Shores 1987 study concluded that the wider the beach, the lower the storm damage. As was proved during Hurricane Andrew, a full beachfront and the dune system can protect the lives and property of Town residents.

Second, a full beachfront is necessary for the reproduction of sea turtles. Renourishing the beach gives additional space for sea turtle nesting and means less likelihood of baby turtles turning to the lights in the west rather than the water in the east. Renourishment of the beaches in Broward County has apparantly led to increased nesting activity on those beaches.

We hope that our concerns will be addressed in your Draft Environmental Impact Statement for Region III.

Sincerely,

Hal Cohen

Hal Cohen
Town Manager

cc: Mayor Paul D. Novack
Senator Bob Graham
Congressman E. Clay Shaw

City of Boca Raton

CITY HALL • 201 WEST PALMETTO PARK ROAD • BOCA RATON, FLORIDA 33432-3795 • PHONE: (407) 393-7700
(FOR HEARING IMPAIRED) TDD: (407) 367-7046
SUNCOM: (407) 922-7700

December 1, 1994

Mr. A.J. Salem
Chief, Planning Division
Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Ed:

This is to acknowledge receipt of your letter of November 8, 1994 concerning the "Coast of Florida Erosion and Storm Effects Study".

As you know, the City of Boca Raton completed a successful beach nourishment project in 1988 in northern Boca Raton for a length of 1.45 miles with funding participation from the Federal and State governments. Post monitoring studies of this project are on file with the DEP in Tallahassee which may be of assistance.

The City is beginning the engineering process for the renourishment of this project projected for construction in 1995/96 depending on the permitting process.

When this project advances through the governmental review process and as your study progresses, if there are any alternatives or suggestions that will enhance the success of this proposed renourishment we would be more than happy to discuss them with you.

It was nice seeing you again at the annual FSBPA meeting this year and I look forward to working with you in the future.

Sincerely,

Ron

Ronald G. Laccheo
Municipal Services Director

c: D. Dreska
K. Mitchell
B. DiChristopher

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019
November 8, 1994

RECEIVED
NOV 14 1994
CITY MANAGER'S OFFICE

REPLY TO
ATTENTION OF
Planning Division
Environmental Branch

TO ADDRESSEES ON THE ATTACHED LIST:

The Jacksonville District, U.S. Army Corps of Engineers, is gathering information to help define issues and concerns that will be addressed in a Draft Environmental Impact Statement for Region III of the Coast of Florida Erosion and Storm Effects Study.

The Coast of Florida Erosion and Storm Effects Study was authorized on 16 July 1984, by Section 104 of the 1985 Appropriations Act (Public Law 98-360). The study is a cooperative effort between the Corps of Engineers and the Florida Department of Environmental Protection, the study sponsor, to investigate coastal processes on a regional basis for the purpose of recommending modifications for existing shore protection and navigation projects.

The study area includes most of the Atlantic and Gulf coast of Florida and has been divided into five coastal regions. The region currently being studied, and is the focus of the DEIS, is Region III which consists of 92 miles of Atlantic Ocean coastline within Palm Beach, Broward, and Dade counties. Refer to the enclosed location map (figure 1). Several alternatives are being considered in the study and will be addressed in the DEIS. These include: 1) continued renourishment of existing projects, 2) design modifications to existing projects where needed, 3) sand bypassing at inlets using sand transfer plants and/or conventional dredging, 4) nearshore placement of suitable maintenance dredged material to feed adjacent beaches, 5) use of suitable maintenance dredged material as beach fill, 6) construction of groins and/or offshore breakwaters, 7) dune construction, 8) construction of sand traps at inlets to aid in sand bypassing, and 9) sand tightening existing jetties to where the need has been identified. Sources of sand that have been identified include offshore borrow areas, upland sand sources, suitable material from maintenance dredging and the possible use of Bahamian aragonite. Significant issues that are anticipated include concern for nearshore and offshore hard bottom communities, fisheries, water quality, and threatened and endangered species.

CITY OF MIAMI BEACH

CITY HALL 1700 CONVENTION CENTER DRIVE MIAMI BEACH FLORIDA 33139

OFFICE OF THE CITY MANAGER

TELEPHONE: (305) 673-7010
FAX: (305) 673-7782

November 28, 1994

A. J. Salem
Chief, Planning Division
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019

Dear Mr. Salem:

Thank you for the opportunity to comment on the Draft Environmental Impact Statement for Region III of the Coast of Florida Erosion and Storm Effects Study. The City of Miami Beach has suffered severe erosion due to Hurricane Andrew, the infamous March 1994 storm, and most recently, Tropical Storm /Hurricane Gordon. The initial renourishment project of the U.S. Army Corps of Engineers, over ten years ago, has provided substantial protection and peace of mind for the 92,000 citizens of Miami Beach, and has created one of the best beaches in South Florida. As storms continue to erode this protection, the City is concerned that the Army Corps take whatever measures necessary to maintain this level of protection.

The Environmental Impact Statement should strongly consider and recommend protective measures that save lives, property and promote the region's #1 economic activity - tourism. Please keep our City informed of any draft documents. We look forward to continued review.

Sincerely,

Roger M. Carlton
City Manager

RMC:jph

cc: Harry S. Mavrogenes, Assistant City Manager
Joe Pinon, Assistant City Manager
Vincent Akhimie, Public Works Director

Town of South Palm Beach

3577 SOUTH OCEAN BOULEVARD
SOUTH PALM BEACH, FLORIDA 33480
(407) 588-8889 • Fax: (407) 588-6632

MARGOT M. ROBERTS - MAYOR
BEVERLY SAVIN - VICE MAYOR

COMMISSIONERS
MAURICE J. JACOBSON
ARTHUR LAVENHAR
ERNEST MURO

November 22, 1994

A. J. Salem
Chief, Planning Division
Jacksonville District
Corps. of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019

Re: Your letter of November 8, 1994

Dear Mr. Salem:

This is in response to your letter of November 8, 1994, requesting views, comments and information having a bearing on the study objectives of the Environmental Impact Statement now under preparation for Region III of the Coast of Florida Erosion and Storm Effects Study. The information furnished herein is limited to the area of South Palm Beach.

In 1987, the Florida Department of Natural Resources (DNR) prepared a Beach Restoration Management Plan for Palm Beach County. It included a Palm Beach/South Palm Beach Shore Protection Project extending four miles from Phipps Ocean Park to Lantana Public Beach. The Department indicated that it will hold this project in a pending status until the necessary sand source investigation and a study of the marine offshore habitat are completed.

In 1993, the Palm Beach Department of Environmental Resources Management (DERM) submitted to DNR the Environmental Assessment Report for this project area. Some of the conclusions are listed below:

> The largest amount of nearshore hardbottom was found in the south end of the survey area between R-132 and the south limit. In this area the hardbottom consisted of at least two bands: a narrow band beginning just below MHW and extending up to 100 feet offshore and a more extensive platform located generally 200 and 500 feet offshore.
>
> The beaches in study area are widest in the north end and become narrow in the south end in South Palm Beach.
>
> A potential borrow area has not been identified. The limited amount of data available on the offshore sediments

in the study area indicates a relatively small grain size of 0.22 mm and 0.42 percentage of silts and clays. The mean grain size of native beach and nearshore sediments in the study area is about 0.38 mm and less than 0.55% silts and clays.

Offshore reefs run throughout the study area beginning 3500 feet to 4000 feet from shore. These reefs are expected to be similar to reefs off Palm Beach Midtown and Ocean Ridge.

A beach nourishment project based on the State project will have much negative impacts to the nearshore hardbottom system and will impact at least 14.6 acres of nearshore hardbottom. The State project would most likely not be permitted by federal, state and local regulatory agencies. Even if it was permitted, mitigation costs could run up to $5.1 million.

Some of the recommendations in the Environmental Assessment Report are listed below:

A feasibility study should be performed to update prior studies and to address new or experimental technologies. The study should consider the results of this environmental assessment when evaluating shoreline protection options.

Dunes should be restored where they have been destroyed or degraded and where there is a sufficiently wide beach to ensure a successful dune restoration project.

In January 1994, DERM issued its Geotechnical Report of an Offshore Sand Search for Palm Beach/South Palm Beach Project. The conclusion was that average composite mean grain size is 18 mm, indicating that this deposit is probably too fine to be usable for beach fill material. It recommended that consideration be given to large sediment deposits offshore of Ocean Ridge as an alternative sand source for beach nourishment, using hopper dredge technology. The mean grain size of that offshore material is 0.32 mm.

In a letter dated September 26, 1994 the new Department of Environmental Protection (DEP), which replaced DNR, informed DERM that FY 1995-96 funding for the Palm Beach/South Palm Beach Project was not approved and will not be recommended for the following reasons:

A. Only that stretch of beach between DNR Range Monuments R-133 and R-137 has been designated as critically eroding by the Florida Department of Environmental Protection. The remainder of the proposed 4.1 mile restoration project is not experiencing critical erosion, thus, does not qualify for state funding for beach restoration.

B. The Department does not consider the area between DNR Range Monument R-133 and R-137, appropriate for beach restoration due to the extent of historically established marine habitat existing in the nearshore that would be severely impacted or destroyed by such a project. This determination was made by both Palm Beach County's Department of Environmental Resource Management, and the staff of the Florida Department of Environmental Protection.

The Department feels that, because of the critically eroding nature of the southern portion of the proposed project (R-133 through R-137), an investigation should be made to determine what erosion control measures can be taken to address that condition.

On October 27, 1994, a meeting was held between County Commissioner Mary McCarty and representatives of DERM and the Towns of Manalapan, Lantana, South Palm Beach and Palm Beach, to discuss dune restoration for South Palm Beach. It was agreed that this Town can be included in a dune project for Lantana Public Beach, provided it does not jeopardize the Lantana project and the Palm Beach Soil and Water Conservation District has no objection. The DERM staff indicated that they will try to do all necessary research for a combined project, in a timely manner, for the 1995/96 Budget. At a meeting of the Palm Beach Soil and Water Conservation District on November 17, 1994, the District approved the combined project, with the condition that it does not jeopardize the original Lantana dune project. It has been determined by DERM Staff that only 615 feet of the South Palm Beach shore is suitable for dune restoration. The remaining 2,185 feet of the Town's shore is fronted by seawalls too close to the water's edge. Dune restoration in the latter areas is not suitable because of the high probability of failure.

We certainly welcome the recent opportunity which became available to have dune restoration, where feasible. This, however, does not solve the problem of our critical erosion in the rest of the Town. As indicated above, DEP suggests that an investigation should be made to determine what measure can be taken to address the critically eroding nature of our area. On the basis of the information furnished herein, we would appreciate any guidance you give as to how best to approach this matter.

Sincerely,

Sam Gofseyeff

Sam Gofseyeff, Chairman
Beach Renourishment Council

SG:emc

210 Military Trail
Jupiter, Florida 33458

407/746-5134
FAX 407/575-7785

Town of Jupiter

November 17, 1994

Planning Division
Environmental Branch
Department of the Army
Jacksonville District Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Dear Gentlemen:

Thank you for informing the Town of Jupiter of the impending Coast of Florida Erosion and Storm Effects Study. At this point, the Town does not have any specific comments to provide; however, we would appreciate being kept informed as to the progress of the study and to receive a copy of the study drafts as they become available.

If there is any particular information that you believe the Town could provide that might be of assistance in the study's preparation, please contact this office at your earliest convenience.

Sincerely,

Sam Shannon, Director
Department of Community Development

SS/bj

cc: Lee R. Evett, Town Manager
Eric Riel, Planning and Zoning Administrator

City of Miami

CESAR H. ODIO
CITY MANAGER

P O BOX 330708
MIAMI, FLORIDA 33233-0708
305-579-6040

A. J. Salem
Chief, Planning Division
Environmental Branch
Department of the Army
Jacksonville District Corps of Engineers
P. O. Box 4970
Jacksonville, FL 32232-0019

RE: Draft Environmental Impact Statement for Region III of the Coast of Florida Erosion and Storm Effects Study

Dear Sir/Madam:

In response to your request for views, comments and information to help define the issues and concerns to be addressed in your draft Environmental Impact Statement for this region regarding coastal erosion and storm effects, the City of Miami would like to remind you of the present situation at the sole beach under its jurisdiction, Virginia Key Beach.

Virginia Key is a low sandy barrier island, consisting of approximately 1,005 acres of upland area. The shoreline fronting the Atlantic Ocean is approximately 9,000 feet long and includes a sandy public beach. This site has been the subject of previous Corps of Engineers stabilization projects.

This shoreline continues to suffer from severe erosion due to strong nearshore waves and tidal currents. Several projects have been carried out to try to control the beach erosion including the installation of twenty-seven (27) timber groins, which have since substantially deteriorated, and the construction of thirteen (13) granite groins.

A beach renourishment project has been recommended. Additionally, in conjunction with the renourishment, the construction of a rock revetment along the southern portion of the shoreline has been recommended as an alternative to help curb the effects of erosion. Consequently, we would appreciate your incorporating the problems being faced at Virginia Key beach as a study objective along with suggesting improvements.

Thank you for your invitation to express our concerns in relation to your study. We hope to receive a copy of your draft once it is published. Please feel free to contact us if you require any additional information.

Sincerely,

Cesar H. Odio
City Manager

cc: Honorable Mayor Stephen P. Clark
Herbert J. Bailey, Asst. City Manager
Carlos F. Smith, Asst. City Manager
Alberto Ruder, Director, Parks and Recreation Dept.

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019
November 8, 1994

REPLY TO
ATTENTION OF
Planning Division
Environmental Branch

TO ADDRESSEES ON THE ATTACHED LIST:

The Jacksonville District, U.S. Army Corps of Engineers, is gathering information to help define issues and concerns that will be addressed in a Draft Environmental Impact Statement for Region III of the Coast of Florida Erosion and Storm Effects Study.

The Coast of Florida Erosion and Storm Effects Study was authorized on 16 July 1984, by Section 104 of the 1985 Appropriations Act (Public Law 98-360). The study is a cooperative effort between the Corps of Engineers and the Florida Department of Environmental Protection, the study sponsor, to investigate coastal processes on a regional basis for the purpose of recommending modifications for existing shore protection and navigation projects.

The study area includes most of the Atlantic and Gulf coast of Florida and has been divided into five coastal regions. The region currently being studied, and is the focus of the DEIS, is Region III which consists of 92 miles of Atlantic Ocean coastline within Palm Beach, Broward, and Dade counties. Refer to the enclosed location map (figure 1). Several alternatives are being considered in the study and will be addressed in the DEIS. These include: 1) continued renourishment of existing projects, 2) design modifications to existing projects where needed, 3) sand bypassing at inlets using sand transfer plants and/or conventional dredging, 4) nearshore placement of suitable maintenance dredged material to feed adjacent beaches, 5) use of suitable maintenance dredged material as beach fill, 6) construction of groins and/or offshore breakwaters, 7) dune construction, 8) construction of sand traps at inlets to aid in sand bypassing, and 9) sand tightening existing jetties to where the need has been identified. Sources of sand that have been identified include offshore borrow areas, upland sand sources, suitable material from maintenance dredging and the possible use of Bahamian aragonite. Significant issues that are anticipated include concern for nearshore and offshore hard bottom communities, fisheries, water quality, and threatened and endangered species.

We welcome your views, comments and information about resources, study objectives and important features within the described area, as well as any suggested improvements. Letters of comment or inquiry should be sent within 30 days to the letterhead address, attention Planning Division, Environmental Branch.

Sincerely,

A. J. Salem
Chief, Planning Division

Enclosures

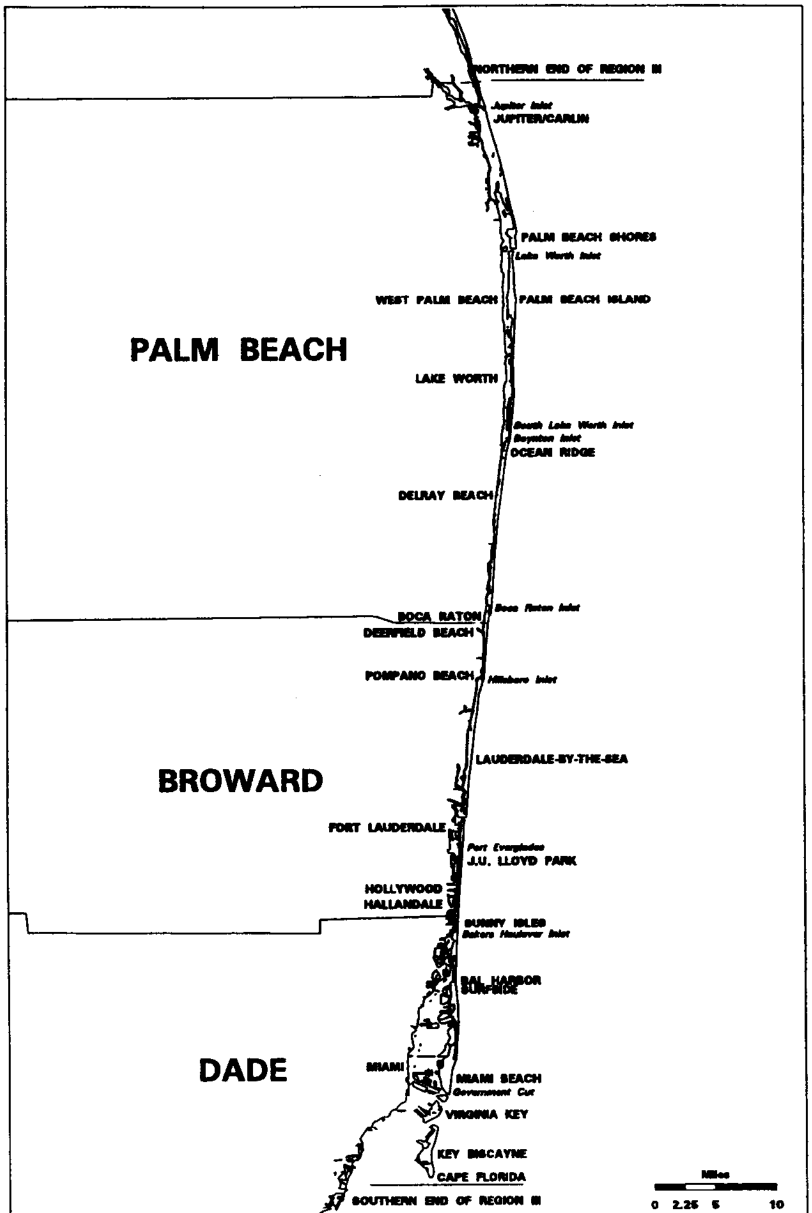

NORTHERN END OF REGION III
Jupiter Inlet
JUPITER/CARLIN
PALM BEACH SHORES
Lake Worth Inlet
WEST PALM BEACH
PALM BEACH ISLAND
PALM BEACH
LAKE WORTH
South Lake Worth Inlet
Boynton Inlet
OCEAN RIDGE
DELRAY BEACH
Boca Raton Inlet
BOCA RATON
DEERFIELD BEACH
POMPANO BEACH
Hillsboro Inlet
LAUDERDALE-BY-THE-SEA
BROWARD
FORT LAUDERDALE
Port Everglades
J.U. LLOYD PARK
HOLLYWOOD
HALLANDALE
SUNNY ISLES
Bakers Haulover Inlet
BAL HARBOR
SURFSIDE
DADE
MIAMI
MIAMI BEACH
Government Cut
VIRGINIA KEY
KEY BISCAYNE
CAPE FLORIDA
SOUTHERN END OF REGION III
Miles
0 2.25 5 10

FIGURE 1

LIST OF ADDRESSEES

**COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY
REGION III**

FEDERAL AGENCIES

US DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
401 SE FIRST AVENUE
GAINESVILLE FL 32602-6489

REGIONAL ENVIRONMENTAL OFFICER
HOUSING & URBAN DEVELOPMENT
ROOM 600-C
75 SPRING STREET SW
ATLANTA GA 30303-3309
(2 CYS)

COMMANDER (OAN)
SEVENTH COAST GUARD DISTRICT
909 SE 1ST AVENUE
BRICKNELL PLAZA FEDERAL BLDG
MIAMI FL 33131-3050

REGIONAL DIRECTOR
INSURANCE & MITIGATION DIVISION
FEMA
1371 PEACHTREE STREET NE
ATLANTA GA 30303-3309

SOUTHERN REGION FORESTER
US FOREST SERVICE
DEPARTMENT OF AGRICULTURE
1720 PEACHTREE ROAD NW
ATLANTA GA 30309-2405

REGIONAL DIRECTOR
US FISH AND WILDLIFE SERVICE
75 SPRING STREET SW
ATLANTA GA 30303-3309

FIELD SUPERVISOR
US FISH AND WILDLIFE SERVICE
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SUITE 310
JACKSONVILLE FL 32216-0912

FIELD SUPERVISOR
U S FISH AND WILDLIFE SERVICE
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VERO BEACH FL 32961-2676

MR HEINZ MUELLER
ENVIRONMENTAL POLICY SECTION
EPA REGION IV
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ATLANTA GA 30365-2401
(5 CYS)

NATIONAL MARINE FISHERIES
SERVICE
ENVIRONMENTAL ASSESSMENT BR
3500 DELWOOD BEACH ROAD
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NATIONAL MARINE FISHERIES SVC
OFFICE OF THE REGIONAL DIRECTOR
9721 EXECUTIVE CENTER DRIVE
ST PETERSBURG FL 33702

NATIONAL MARINE FISHERIES SERVICE
CHIEF, PROTECTED SPECIES BRANCH
9721 EXECUTIVE CENTER DRIVE
ST PETERSBURG FL 33702

STATE AGENCIES

STATE CLEARINGHOUSE
OFFICE OF PLANNING & BUDGETING
EXEC OFC OF THE GOVERNOR
THE CAPITOL
TALLAHASSEE FL 32301-8074
(16 CYS)

MR GEORGE W PERCY DIRECTOR
DIV OF HISTORICAL RESOURCES
STATE HISTORIC PRESERVATION OFF
R A GRAY BUILDING
TALLAHASSEE FL 32399

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WEST PALM BEACH FL 33406

FLORIDA DEPT OF ENV PROTECTION
DIVISION OF STATE LANDS
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WEST PALM BEACH FL 33406

SOUTH FLORIDA WATER MANAGEMENT
DISTRICT
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WEST PALM BEACH FL 33416

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RECREATION
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ENVIRONMENTAL SCIENCE AND
ENGINEERING
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AND BUILDING
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WEST PALM BEACH FL 33415-1311

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COUNTY
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PALM BEACH COUNTY TOURIST
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STEPHEN H HIGGINS ASST. DIRECTOR
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BROWARD COUNTY PLANNING DIVISION
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FORT LAUDERDALE FL 33301

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BROWARD COUNTY BOARD OF COUNTY
COMMISSIONERS
115 S ANDREWS AVENUE ROOM 421
FORT LAUDERDALE FL 33301-1872

COMMISSIONER SCOTT I COWAN
BROWARD COUNTY BOARD OF COUNTY
COMMISSIONERS
115 S ANDREWS AVENUE ROOM 421
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DIRECTOR
METRO DADE PARK AND RECREATION DEPARTMENT
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DIRECTOR
PUBLIC REL/COMMUNICATIONS MGR
GREATER FORT LAUDERDALE
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PALM BEACH POST
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WEST PALM BEACH FL 33405-4700

HI-RISER
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SOUTH FLORIDA REG PLNG COUNCIL
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HOLLYWOOD FL 33021

DIRECTOR
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1700 CONVENTION CENTER DRIVE
MIAMI BEACH FL 33149

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MAYOR
CITY OF BOCA RATON
201 W PALMETTO PARK ROAD
BOCA RATON FL 33432

CITY MANAGER
CITY OF BOCA RATON
201 W PALMETTO PARK ROAD
BOCA RATON FL 33432

MAYOR
CITY OF BOYNTON BEACH
100 E BOYNTON BEACH BLVD
BOYNTON BEACH FL 33435

CITY MANAGER
CITY OF BOYNTON BEACH
100 E BOYNTON BEACH BLVD
BOYNTON BEACH FL 33435

MAYOR
TOWN OF BRINY BREEZES
5000 N OCEAN BOULEVARD
BOYNTON BEACH FL 33435

TOWN MANAGER
TOWN OF BRINY BREEZES
5000 N OCEAN BOULEVARD
BOYNTON BEACH FL 33435

MAYOR
CITY OF DELRAY BEACH
100 N W FIRST AVENUE
DELRAY BEACH FL 33444

CITY MANAGER
CITY OF DELRAY BEACH
100 N W FIRST AVENUE
DELRAY BEACH FL 33444

MAYOR
TOWN OF GULF STREAM
100 SEA ROAD
GULF STREAM FL 33483

TOWN MANAGER
TOWN OF GULF STREAM
100 SEA ROAD
GULF STREAM FL 33483

MAYOR
TOWN OF HIGHLAND BEACH
3614 S OCEAN BOULEVARD
HIGHLAND BEACH FL 33487

TOWN MANAGER
TOWN OF HIGHLAND BEACH
3614 S OCEAN BOULEVARD
HIGHLAND BEACH FL 33487

MAYOR
TOWN OF JUNO BEACH
340 OCEAN DRIVE
JUNO BEACH FL 33408

TOWN MANAGER
TOWN OF JUNO BEACH
340 OCEAN DRIVE
JUNO BEACH FL 33408

MAYOR
TOWN OF JUPITER
210 MILITARY TRAIL
JUPITER FL 33458

TOWN MANAGER
TOWN OF JUPITER
210 MILITARY TRAIL
JUPITER FL 33458

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LAKE WORTH FL 33460

CITY MANAGER
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7 N DIXIE HIGHWAY
LAKE WORTH FL 33460

MAYOR
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500 GREYNOLDS CIRCLE
LANTANA FL 33462

TOWN MANAGER
TOWN OF LANTANA
500 GREYNOLDS CIRCLE
LANTANA FL 33462

MAYOR
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600 S OCEAN BOULEVARD
MANALAPAN FL 33462-3321

TOWN MANAGER
TOWN OF MANALAPAN
600 S OCEAN BOULEVARD
MANALAPAN FL 33462-3321

MAYOR
VILLAGE OF NORTH PALM BEACH
501 FEDERAL HIGHWAY
NORTH PALM BEACH FL 33408

VILLAGE MANAGER
VILLAGE OF NORTH PALM BEACH
501 FEDERAL HIGHWAY
NORTH PALM BEACH FL 33408

MAYOR
TOWN OF OCEAN RIDGE
6450 N OCEAN BOULEVARD
OCEAN RIDGE FL 33435

TOWN MANAGER
TOWN OF OCEAN RIDGE
6450 N OCEAN BOULEVARD
OCEAN RIDGE FL 33435

MAYOR
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P O BOX 2029
PALM BEACH FL 33480

TOWN MANAGER
TOWN OF PALM BEACH
P O BOX 2029
PALM BEACH FL 33480

MAYOR
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247 EDWARDS LANE
PALM BEACH SHORES FL 33404

MAYOR
CITY OF RIVIERA BEACH
600 W BLUE HERON BOULEVARD
RIVIERA BEACH FL 33404

CITY MANAGER
CITY OF RIVIERA BEACH
600 W BLUE HERON BOULEVARD
RIVIERA BEACH FL 33404

MAYOR
TOWN OF SOUTH PALM BEACH
3577 S OCEAN BOULEVARD
SOUTH PALM BEACH FL 33480

TOWN MANAGER
TOWN OF SOUTH PALM BEACH
3577 S OCEAN BOULEVARD
SOUTH PALM BEACH FL 33480

MAYOR
VILLAGE OF TEQUESTA
P O BOX 3273
TEQUESTA FL 33469

VILLAGE MANAGER
VILLAGE OF TEQUESTA
P O BOX 3273
TEQUESTA FL 33469

CITY MANAGER
CITY OF DANIA
CITY HALL
100 W DANIA BEACH BLVD
DANIA FL 33004

MAYOR
CITY OF DANIA
CITY HALL
100 W DANIA BEACH BLVD
DANIA FL 33004

CITY MANAGER
CITY OF DEERFIELD BEACH
CITY HALL
150 N W SECOND AVENUE
DEERFIELD BEACH FL 33441

MAYOR
CITY OF DEERFIELD BEACH
CITY HALL
150 N W SECOND AVENUE
DEERFIELD BEACH FL 33441

CITY MANAGER
CITY OF FORT LAUDERDALE
CITY HALL
P O DRAWER 14250
FORT LAUDERDALE FL 33302

MAYOR
CITY OF FORT LAUDERDALE
CITY HALL
P O DRAWER 14250
FORT LAUDERDALE FL 33302

CITY MANAGER
CITY OF HALLANDALE
CITY HALL
308 S DIXIE HIGHWAY
HALLANDALE FL 33009

MAYOR
CITY OF HALLANDALE
CITY HALL
308 S DIXIE HIGHWAY
HALLANDALE FL 33009

TOWN MANAGER
TOWN OF HILLSBORO BEACH
TOWN HALL
1210 HILLSBORO BEACH
POMPANO BEACH FL 33062

MAYOR
TOWN OF HILLSBORO BEACH
TOWN HALL
1210 HILLSBORO BEACH
POMPANO BEACH FL 33062

CITY MANAGER
CITY OF HOLLYWOOD
CITY HALL
P O BOX 229045
HOLLYWOOD FL 33022-9045

MAYOR
CITY OF HOLLYWOOD
CITY HALL
P O BOX 229045
HOLLYWOOD FL 33022-9045

TOWN MANAGER
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TOWN HALL
4501 OCEAN DRIVE
LAUDERDALE-BY-THE-SEA FL 33308

MAYOR
TOWN OF LAUDERDALE-BY-THE-SEA
TOWN HALL
4501 OCEAN DRIVE
LAUDERDALE-BY-THE-SEA FL 33308

ADMINISTRATIVE ASST TO THE MAYOR
CITY OF LIGHTHOUSE POINT
CITY HALL
P O BOX 5100
LIGHTHOUSE POINT FL 33064

MAYOR
CITY OF LIGHTHOUSE POINT
CITY HALL
P O BOX 5100
LIGHTHOUSE POINT FL 33064

CITY MANAGER
CITY OF OAKLAND PARK
CITY HALL
3650 NE 12TH AVENUE
OAKLAND PARK FL 33334

CITY MANAGER
CITY OF POMPANO BEACH
CITY HALL
100 W ATLANTIC BLVD
P O DRAWER 1300
POMPANO BEACH FL 33061

MAYOR
CITY OF POMPANO BEACH
CITY HALL
100 W ATLANTIC BLVD
P O DRAWER 1300
POMPANO BEACH FL 33061

CITY MANAGER
CITY OF MIAMI BEACH
TOWN HALL
1700 CONVENTION HALL CENTER
MIAMI BEACH FL 33139

MAYOR
CITY OF MIAMI BEACH
1700 CONVENTION CENTER DRIVE
MIAMI BEACH FL 33139

CITY MANAGER
CITY HALL
6130 SUNSET DRIVE
SOUTH MIAMI FL 33143

MAYOR
CITY OF SOUTH MIAMI
6130 SUNSET DRIVE
SOUTH MIAMI FL 33143

CITY MANAGER
CITY OF MIAMI
CITY HALL
3500 PAN AMERICAN DR
MIAMI FL 33133

CITY MANAGER
CITY OF NORTH MIAMI BEACH
CITY HALL
17011 NE 19 AVENUE
NORTH MIAMI BEACH FL 33162

CITY MANAGER
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85 WEST MACINTYRE STREET
KEY BISCAYNE FL 33149

MAYOR
CITY OF NORTH MIAMI
776 N E 125 STREET
NORTH MIAMI FL 33161

MAYOR
INDIAN CREEK VILLAGE
50 INDIAN CREEK ISLAND
INDIAN CREEK VILLAGE FL 33154

MAYOR
CITY OF MIAMI SHORES
10050 N E 2 AVENUE
MIAMI SHORES FL 33138

MAYOR
NORTH BAY VILLAGE
7903 EAST DRIVE
NORTH BAY VILLAGE FL 33141

MAYOR
CITY OF MIAMI
3500 PAN AMERICAN DRIVE
MIAMI FL 33133

MAYOR
CITY OF WEST MIAMI
901 S W 62 AVENUE
WEST MIAMI FL 33144

MAYOR
VILLAGE OF KEY BISCAYNE
85 WEST MACINTYRE STREET
KEY BISCAYNE FL 33149

MAYOR
TOWN OF GOLDEN BEACH
ONE GOLDEN BEACH DR
GOLDEN BEACH FL 33160

TOWN MANAGER
TOWN OF GOLDEN BEACH
TOWN HALL
ONE GOLDEN BEACH DRIVE
GOLDEN BEACH FL 33160

TOWN MANAGER
TOWN OF SURFSIDE
9293 HARDING AVENUE
SURFSIDE FL 33154

MAYOR
TOWN OF SURFSIDE
9293 HARDING AVENUE
SURFSIDE FL 33154

VILLAGE MANAGER
VILLAGE OF BAL HARBOUR
655 96 STREET
BAL HARBOUR FL 33154

MAYOR
VILLAGE OF BAL HARBOR
655 96 STREET
BAL HARBOR FL 33154

TOWN MANAGER
TOWN OF BAY HARBOR ISLAND
TOWN HALL
9665 BAY HARBOR TERRACE
BAY HARBOR ISLAND FL 331543

MAYOR
TOWN OF BAY HARBOR ISLAND
9655 BAY HARBOR TERRACE
BAY HARBOR ISLAND FL 33154

INTEREST GROUPS

FLORIDA AUDUBON SOCIETY
460 HIGHWAY 436
SUITE 200
CASSELBERRY FL 32707

MR JOHN RAINS JR
ISAAK WALTON LEAGUE OF AMERICA INC
5314 BAY STATE ROAD
PALMETTO FL 33561-9712

FLORIDA WILDLIFE FEDERATION
PO BOX 6870
TALLAHASSEE FL 32314-6870

PROFESSOR JOHN GIFFORD
ROSENSTIEL SCHOOL OF MARINE
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4600 RICKENBACKER CAUSEWAY
MIAMI FL 33149-1098

ENVIRONMENTAL SERVICES INC
8711 PERIMETER PARK BLVD
SUITE 11
JACKSONVILLE FL 32216

CARIBBEAN CONSERVATION CORP
PO BOX 2866
GAINESVILLE FL 32602

JOHN D MACARTHUR STATE PARK
10900 STATE ROAD 703
NORTH PALM BEACH FL 33408

SIERRA CLUB - LOXAHATCHEE GROUP
P O BOX 6271
LAKE WORTH FL 33461

AUDUBON SOCIETY OF THE EVERGLADES
P O BOX 16914
WEST PALM BEACH FL 33416-6914

ROYAL PALM AUDUBON SOCIETY
1300 NW 6TH STREET
BOCA RATON FL 33486

FLORIDA OCEANOGRAPHIC SOCIETY
890 N E OCEAN BOULEVARD
STUART FL 34996

AMERICAN LITTORAL SOCIETY
2809 BIRD AVENUE SUITE 162
MIAMI FL 33133

FLORIDA NATIVE PLANT SOCIETY
7667 PARK LANE
LAKE WORTH FL 33467

FLORIDA MARINE CONSERVATION
CORPORATION
160 ELAINE ROAD
WEST PALM BEACH FL 33413

CENTER FOR MARINE CONSERVATION
ONE BEACH DRIVE S E #304
ST PETERSBURG FL 33701

EASTERN SURFING ASSOCIATION
625 LAKESIDE HARBOUR
BOYNTON BEACH FL

FLORIDA SHORE AND BEACH
PRESERVATION ASSOCIATION (FSBPA)
864 EAST PARK AVENUE
TALLAHASSEE FL 32301

FLORIDA SHORE AND BEACH
PRESERVATION ASSOCIATION
SINGER ISLAND CHAPTER
5200 N OCEAN DRIVE #1006
RIVIERA BEACH FL 33404

JOHN SZELIGOWSKI
TAMS CONSULTANTS
655 3RD AVENUE
NEW YORK NY 10017

MR JOHN FLICKER
THE NATURE CONSERVANCY
2699 LEE ROAD #500
WINTER PARK FL 32789

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P O BOX 430741
MIAMI FL 33142-0741

CONSERVATION CHAIRMAN
SIERRA CLUB
9829 S W 62 COURT
MIAMI FL 33156

CHAIRMAN
AMERICAN LITTORAL SOCIETY
75 VIRGINIA BEACH DR
KEY BISCAYNE FL 33149

CHAIRMAN
ENVIRONMENTAL INFORMATION SERVICE
101 WESTWARD DRIVE #2
MIAMI SPRINGS FL 33166

TROPICAL AUDUBON SOCIETY
18014 S W 83 COURT
MIAMI FL 33157

REGIONAL DIRECTOR
THE WILDERNESS SOCIETY
4203 PONCE DE LEON
CORAL GABLES FL 33146

KEN WELT
EXECUTIVE DIRECTOR
SUNNY ISLES RESORT ASSOCIATION
17100 COLLINS AVENUE SUITE 217
SUNNY ISLES BEACH FL 33160

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PALM BEACH GARDENS FL 33410

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FLORIDA HOUSE OF REPRESENTATIVES
2300 VIRGINIA AVE RM 200
FORT PIERCE FL 34982

THE HONORABLE TOM WARNER
FLORIDA HOUSE OF REPRESENTATIVES
969 S FEDERAL HWY #401
STUART FL 34994

THE HONORABLE SHARON MERCHANT
FLORIDA HOUSE OF REPRESENTATIVES
721 U S HWY 1 #110
NORTH PALM BEACH FL 33408

THE HONORABLE ADDIE GREENE
FLORIDA HOUSE OF REPRESENTATIVES
5601 CORPORATE WAY #301
WEST PALM BEACH FL 33407

THE HONORABLE MIMI MCANDREWS
FLORIDA HOUSE OF REPRESENTATIVES
1645 PALM BEACH LAKES #740
WEST PALM BEACH FL 33401

THE HONORABLE ED HEALEY
FLORIDA HOUSE OF REPRESENTATIVES
50 S MILITARY TRAIL #205
WEST PALM BEACH FL 33415

THE HONORABLE CAROL HANSON
FLORIDA HOUSE OF REPRESENTATIVES
777 E ATLANTIC AVE #224
DELRAY BEACH FL 33483

THE HONORABLE SUZANNE JACOBS
FLORIDA HOUSE OF REPRESENTATIVES
990 S CONGRESS AVE
SUITE 5
DELRAY BEACH FL 33445

THE HONORABLE RON KLEIN
FLORIDA HOUSE OF REPRESENTATIVES
8177 W GLADES RD #211
BOCA RATON FL 33434

THE HONORABLE DEBBY SANDERSON
FLORIDA HOUSE OF REPRESENTATIVES
4800 N E 20 TERRACE #401
FORT LAUDERDALE FL 33308

THE HONORABLE WILLIAM G MYERS
FLORIDA STATE SENATE
50 KINDRED ST #301
STUART FL 34994-3058

THE HONORABLE ROBERT WEXLER
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2500 N MILITARY TRAIL #252
BOCA RATON FL 33431

THE HONORABLE KENNETH JENNE II
FLORIDA STATE SENATE
612 SE 5TH AVE #3
FORT LAUDERDALE FL 33301

THE HONORABLE MATTHEW MEADOWS
FLORIDA STATE SENATE
800 W OAKLAND PARK BLVD
FORT LAUDERDALE FL 33311

THE HONORABLE JIM SCOTT
FLORIDA STATE SENATE
2000 E OAKLAND PARK BLVD
FORT LAUDERDALE FL 33306

THE HONORABLE MARK FOLEY
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2324 S CONGRESS AVE 2A
WEST PALM BEACH FL 33406

THE HONORABLE JOHN RAYSON
FLORIDA HOUSE OF REPRESENTATIVES
950 N FEDERAL HIGHWAY 109
POMPANO BEACH FL 33062

THE HONORABLE TRACY STAFFORD
FLORIDA HOUSE OF REPRESENTATIVES
CITY PARK MALL 128 S E 1 STREET
FORT LAUDERDALE FL 33301

THE HONORABLE M MANDY DAWSON
FLORIDA HOUSE OF REPRESENTATIVES
612 N ANDREWS AVENUE
FORT LAUDERDALE FL 33311

THE HONORABLE JOSEPHUS EGGELETION
FLORIDA HOUSE OF REPRESENTATIVES
4315 N STATE ROAD 7
LAUDERDALE LAKES FL 33319

THE HONORABLE JACK TOBIN
FLORIDA HOUSE OF REPRESENTATIVES
4800 W COPANS ROAD
COCONUT CREEK FL 33063

THE HONORABLE BEN GRABER
FLORIDA HOUSE OF REPRESENTATIVES
2929 UNIVERSITY DRIVE 200
CORAL SPRINGS FL 33065

THE HONORABLE DEBBIE W SCHULTZ
FLORIDA HOUSE OF REPRESENTATIVES
13090 WEST STATE ROAD 84
DAVIE FL 33325

THE HONORABLE STEVEN BRIAN FEREN
FLORIDA HOUSE OF REPRESENTATIVES
400 N W 73 AVENUE
PLANTATION FL 33317

THE HONORABLE ANNE MACKENZIE
FLORIDA HOUSE OF REPRESENTATIVES
1000 S FEDERAL HIGHWAY 105
FORT LAUDERDALE FL 33316

THE HONORABLE FRED LIPPMAN
FLORIDA HOUSE OF REPRESENTATIVES
4000 HOLLYWOOD BOULEVARD 330 N
HOLLYWOOD FL 33021-6744

THE HONORABLE STEVEN GELLER
FLORIDA HOUSE OF REPRESENTATIVES
1250 E HALLANDALE BEACH BLVD 604
HALLANDALE FL 33009

THE HONORABLE HOWARD FORMAN
FLORIDA STATE SENATE
4000 HOLLYWOOD BOULEVARD 340 N
HOLLYWOOD FL 33021-6744

THE HONORABLE PETER M WEINSTEIN
FLORIDA STATE SENATE
7880 N UNIVERSITY DR 301
TAMARAC FL 33321

THE HONORABLE ART SIMON
FLORIDA LEGISLATURE
13500 NORTH KENDALL DRIVE
SUITE 220
MIAMI FL 33186

THE HONORABLE HARRY JOHNSTON
U S HOUSE OF REPRESENTATIVES
1501 CORPORATE DRIVE 205
BOYNTON BEACH FL 33426

THE HONORABLE PETER DEUTSCH
U S HOUSE OF REPRESENTATIVES
10100 PINES BOULEVARD
PEMBROKE PINES FL 33025

THE HONORABLE E CLAY SHAW
U S HOUSE OF REPRESENTATIVES
1512 E BROWARD BOULEVARD SUITE 101
FORT LAUDERDALE FL 33301

THE HONORABLE ALCEE L HASTINGS
U S HOUSE OF REPRESENTATIVES
2701 W OAKLAND PARK BLVD SUITE 200
OAKLAND PARK FL 33311

THE HONORABLE BOB GRAHAM
UNITED STATES SENATE
COURTHOUSE TOWER
44 W FLAGLER STREET 17
MIAMI FL 33130

THE HONORABLE CONNIE MACK
UNITED STATES SENATE
777 BRICKELL AVENUE 704
MIAMI FL 33131

TOWN MANAGER
TOWN OF PALM BEACH
P O BOX 2029
PALM BEACH FL 33480

MAYOR
TOWN OF PALM BEACH SHORES
247 EDWARDS LANE
PALM BEACH SHORES FL 33404

MAYOR
CITY OF RIVIERA BEACH
600 W BLUE HERON BOULEVARD
RIVIERA BEACH FL 33404

CITY MANAGER
CITY OF RIVIERA BEACH
600 W BLUE HERON BOULEVARD
RIVIERA BEACH FL 33404

MAYOR
TOWN OF SOUTH PALM BEACH
3577 S OCEAN BOULEVARD
SOUTH PALM BEACH FL 33480

TOWN MANAGER
TOWN OF SOUTH PALM BEACH
3577 S OCEAN BOULEVARD
SOUTH PALM BEACH FL 33480

MAYOR
VILLAGE OF TEQUESTA
P O BOX 3273
TEQUESTA FL 33469

VILLAGE MANAGER
VILLAGE OF TEQUESTA
P O BOX 3273
TEQUESTA FL 33469

CITY MANAGER
CITY OF DANIA
CITY HALL
100 W DANIA BEACH BLVD
DANIA FL 33004

MAYOR
CITY OF DANIA
CITY HALL
100 W DANIA BEACH BLVD
DANIA FL 33004

CITY MANAGER
CITY OF DEERFIELD BEACH
CITY HALL
150 N W SECOND AVENUE
DEERFIELD BEACH FL 33441

MAYOR
CITY OF DEERFIELD BEACH
CITY HALL
150 N W SECOND AVENUE
DEERFIELD BEACH FL 33441

CITY MANAGER
CITY OF FORT LAUDERDALE
CITY HALL
P O DRAWER 14250
FORT LAUDERDALE FL 33302

MAYOR
CITY OF FORT LAUDERDALE
CITY HALL
P O DRAWER 14250
FORT LAUDERDALE FL 33302

CITY MANAGER
CITY OF HALLANDALE
CITY HALL
308 S DIXIE HIGHWAY
HALLANDALE FL 33009

MAYOR
CITY OF HALLANDALE
CITY HALL
308 S DIXIE HIGHWAY
HALLANDALE FL 33009

TOWN MANAGER
TOWN OF HILLSBORO BEACH
TOWN HALL
1210 HILLSBORO BEACH
POMPANO BEACH FL 33062

MAYOR
TOWN OF HILLSBORO BEACH
TOWN HALL
1210 HILLSBORO BEACH
POMPANO BEACH FL 33062

CITY MANAGER
CITY OF HOLLYWOOD
CITY HALL
P O BOX 229045
HOLLYWOOD FL 33022-9045

MAYOR
CITY OF HOLLYWOOD
CITY HALL
P O BOX 229045
HOLLYWOOD FL 33022-9045

TOWN MANAGER
TOWN OF LAUDERDALE-BY-THE-SEA
TOWN HALL
4501 OCEAN DRIVE
LAUDERDALE-BY-THE-SEA FL 33308

MAYOR
TOWN OF LAUDERDALE-BY-THE-SEA
TOWN HALL
4501 OCEAN DRIVE
LAUDERDALE-BY-THE-SEA FL 33308

Mr. Kenneth Oprisko, Chief, Labor Relations Branch, Field Advisory Services Division, Defense Civilian Personnel Management Service, 2461 Eisenhower Ave., Hoffman Building #1, Suite 152, Alexandria, VA 22331–0900, (703) 325–1380.

Dated: November 21, 1994.

Patricia L. Toppings,

Alternate OSD Federal Register Liaison Officer, Department of Defense.

[FR Doc. 94–29146 Filed 11–25–94; 8:45 am]

[illegible]G CODE 5000-04-M

Department of the Army

Intent To Prepare a Draft Environmental Impact Statement (DEIS) for the Coast of Florida Erosion and Storm Effects Study in Palm Beach, Broward, and Dade Counties, Florida

AGENCY: U.S. Army Corps of Engineers, DOD.

ACTION: Notice of intent.

SUMMARY: The Jacksonville District, U.S. Army Corps of Engineers intends to prepare a Draft Environmental Impact Statement for Region III of the Coast of Florida Erosion and Storm Effects Study. The study is a cooperative effort between the Corps of Engineers and the Florida Department of Environmental Protection, the study sponsor, to investigate coastal processes on a regional basis to recommend modifications for existing shore protection and navigation projects.

ADDRESSES: U.S. Army Corps of Engineers, Jacksonville District, Environmental Branch, Planning Division, P.O. Box 4970, Jacksonville, Florida 32232–0019.

FOR FURTHER INFORMATION CONTACT: Mr. Michael Dupes, (904) 232–1689.

SUPPLEMENTARY INFORMATION: 1. The Coast of Florida Erosion and Storm Effects Study was authorized on 16 July 1984, by Section 104 of the 1985 Appropriations Act (Public Law 98–360). The study area includes most of the Atlantic and Gulf coast of Florida and has been divided into five coastal regions. The region currently being studied, and is the focus of the DEIS, is Region III which consists of 92 miles of Atlantic Ocean coastline within Palm beach, Broward, and Dade counties. Several alternatives are being considered in the study and will be addressed in the DEIS. These include:

a. Continued renourishment of existing projects.

b. Design modifications to existing projects where needed.

c. Sand bypassing at inlets using sand transfer plants and/or conventional dredging.

d. Nearshore placement of suitable maintenance dredged material to feed adjacent beaches.

5. Use of suitable maintenance dredged material as beach fill.

6. Construction of groins and/or offshore breakwaters.

7. Dune construction.

8. Construction of sand traps at inlets to aid in sand bypassing.

9. Sand tightening existing jetties where the need has been identified. Sources of sand that have been identified include offshore borrow areas, upland sand sources, suitable material from maintenance dredging and the possible use of Bahamian aragonite.

2. Scoping: The scoping process will involve Federal, State, county and municipal agencies, and other interested persons and organizations. A scoping letter (November 8, 1994) has been sent to interested Federal, State, county and municipal agencies requesting their comments and concerns. Any persons and organizations wishing to participate in the scoping process should contact the U.S. Army Corps of Engineers at the above address. Significant issues that are anticipated include concern for offshore hard bottom communities, fisheries, water quality, sea turtles and cultural resources.

3. Coordination with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service will be accomplished in compliance with section 7 of the Endangered Species Act. Coordination required by applicable Federal and State laws and policies will be conducted. Since the project will require the discharge of material into waters of the United States, the discharge will comply with the provisions of section 404 of the Clean Water Act as amended.

4. DEIS Preparation: It is estimated that the DEIS will be available to the public during May of 1995.

Kenneth L. Denton,

Army Federal Register Liaison Officer.

[FR Doc. 94–29135 Filed 11–25–94; 8:45 am]

BILLING CODE 3710–AJ–M

Availability for Exclusive, Partially Exclusive, or Nonexclusive Licensing of a U.S. Patent Concerning a Shaping Apparatus for an Explosive Charge

AGENCY: U.S. Army Engineer Waterways Experiment Station, DOD.

ACTION: Notice of availability.

UMMARY: In accordance wit
04.7(a)(1)(i), announcement
e availability of U.S. Paten
r licensing. This patent has
ssigned to the United States
s represented by the Secreta
rmy, Washington, D.C.

DDRESSES: U.S. Army Corps
ngineers, Waterways Experi
tation, ATTN: CEWES–CT–
icksburg, MS 39180–6199.

OR FURTHER INFORMATION CO
Mr. Jack A. Little, (601) 634–

UPPLEMENTARY INFORMATION:
nvention provides a shaping
or an explosive charge to be
n Explosively Formed Pene
he shaping apparatus comp
onmetal mold in the form o
f a cone with a latch and hi
ttached thereto. The mold i
acked with a plastic bonde
o form an explosive charge.
FPs are limited in performa
oor projectile formation pa
aused by nonuniform appli
he explosive into the rear p
FP. This invention disclose
f an explosive shaping app
hich provides uniform app
he explosive on to the EFP,
mproved EFP slug formatio
haracteristics. The EFP star
s increased by as much as 4
tandoff munitions, like the
vide potential application f
se, including demolition o
unkers and off-road mine u
dditionally, the EFP could
he mining industry to clear

Under the authority of sec
f the Federal Technology T
f 1986 (Pub. L. 99–502) an
f title 35, U.S. Code, the De
he Army, Corps of Enginee
Vaterways Experiment Stati
o license the above United
n an exclusive, partially ex
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nterested in using the techn
escribed in the above ment
atent. Any interested party
o submit a proposal for an e
artially exclusive, or non-e
icense. The proposals for u
echnology will be evaluate
ollowing criteria: technical
ize of business, and develo
lan.

Kenneth L. Denton,

Army Federal Register Liaison O

FR Doc. 94–29136 Filed 11–25

ILLING CODE 3710–PU–M

Appendix D

PERTINENT CORRESPONDENCE

United States Department of the Interior

OFFICE OF THE SECRETARY
OFFICE OF ENVIRONMENTAL POLICY AND COMPLIANCE
Richard B. Russell Federal Building
75 Spring Street, S.W.
Atlanta, Georgia 30303

October 30, 1996

ER-96/517

Colonel Terry Rice,
District Engineer
U. S. Army Corps of Engineers
P. O. Box 4970
Jacksonville, FL 32232-0019

Dear Colonel Rice:

This is a follow-up letter to the Department's comments dated September 17, 1996, on the Draft Feasibility Report and Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III. This letter is provided to clarify comments contained in that letter.

The Draft Feasibility Report and EIS indicates that three (3) actions are currently proposed for Federal participation (sand transfer plants at Lake Worth Inlet and South Lake Worth Inlet and beach nourishment at Dania). The document indicates that these actions would have minimal effects on hardgrounds, endangered species, and other fish and wildlife resources. The Fish and Wildlife Service does not object, under certain conditions, to these three (3) projects.

Our recommendation for approval of these features in the final feasibility report is contingent upon: 1.) The Corps obtaining a segment specific Coordination Act Report (CAR) prior to final design and construction; and 2.) Verification of minimal impact on fish and wildlife resources.

I hope this information clarifies our previous comments. If there are questions, please call either my office at 404/331-4524, or the Vero Beach Office of the Fish and Wildlife Service at 407/562-3909.

Sincerely,

James H. Lee

James H. Lee
Regional Environmental Officer

United States Department of the Interior

OFFICE OF THE SECRETARY
OFFICE OF ENVIRONMENTAL POLICY AND COMPLIANCE
Richard B. Russell Federal Building
75 Spring Street, S.W.
Atlanta, Georgia 30303

September 17, 1996

ER 96/0517

Colonel Terry Rice
District Engineer
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Colonel Rice:

The Department of the Interior (Department) has reviewed the Draft Feasibility Report and Draft Environmental Impact Statement (DEIS) for the Coast of Florida Erosion and Storm Effects Study, Region III.

The Draft Feasibility Report identifies as many as 27 federal projects, 14 of which require first time Congressional authorization, spanning 60 miles of coastline in Dade, Broward, and Palm Beach Counties, Florida. These federal Civil Works projects involve construction of breakwaters, groins and nearshore berms and dredging of sand for beach nourishment, as well as construction of sand transfer facilities, for storm protection purposes.

The Department offers the following comments.

DRAFT ENVIRONMENTAL IMPACT STATEMENT

General Comments

The DEIS includes an "Interim Fish and Wildlife Coordination Act Report" from the the U.S. Fish and Wildlife Service (FWS), Vero Beach, Florida, dated September 30, 1994. That report was provided to the Army Corps of Engineers (Corps) in partial fulfillment of the coordination requirements of section 2(b) of the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*) (Act), and, as stated in the report, does not represent the final report, based on the surveys and views of the FWS, of the Secretary of the Interior to Congress. Accordingly, further coordination between the Corps and the FWS will be required as more detailed project plans are formulated for each federal project.

Until the necessary coordination with the FWS is completed, the Department recommends that those projects and project modifications not be authorized. This recommendation is based on the lack of sufficient environmental assessment of the affected nearshore subtidal habitats. Specifically, according to the DEIS, a total of 61 acres of subtropical and tropical living reef would be eliminated due to direct burial. Unknown impacts would also occur to coral reefs located adjacent to proposed borrow sites. The cumulative effects of multiple federal projects encompassing over 60 miles of the coastline of southeast Florida on the living marine resources (important recreational and commercial taxa of finfishes and crustaceans) has not been adequately documented, nor has the FWS been afforded the opportunity to "*determine the possible damage to wildlife resources*" and to determine "*means and measures that should be adopted to prevent the loss or damage to such wildlife resources*" as required in section 2(b) of the Act.

The Department also supports the recommendations of the Corps in paragraphs 315 and 315a of the Draft Feasibility Report that these projects not be authorized based on the President's commitment to focus limited federal resources on the development of water resources projects that have national significance.

Consultation under Section 7 of the Endangered Species Act of 1973, as amended, (16 U.S.C. 1531 *et seq.*) has been initiated by the Corps concerning the proposed projects. A biological opinion addressing potential adverse effects on four species of threatened and endangered sea turtles will be issued in the near future.

Thank you for providing us with this opportunity to provide these comments. If you require further clarification or assistance please contact Charles Sultzman or David Ferrell of the FWS's Vero Beach, Florida, Office at (407) 562-3909.

Sincerely,

James H. Lee
Regional Environmental Officer

RESPONSE TO COMMENTS FROM THE U.S. DEPARTMENT OF THE INTERIOR, LETTERS DATED SEPTEMBER 17, 1996 AND OCTOBER 30 1996.

1. Concur. Additional environmental work and coordination would occur during the planning, engineering and design (PED) phase for the proposed sand transfer plants at Lake Worth and South Lake Worth Inlets and the proposed beach nourishment at Dania. Supplemental NEPA documentation would also be completed and the USFWS will be able to perform the required environmental assessments needed to prepare ~~a~~ segment specific Coordination Act Reports

United States Department of the Interior

FISH AND WILDLIFE SERVICE
P.O. Box 2676
Vero Beach, Florida 32961-2676
October 24, 1996

IN REPLY REFER TO:

Colonel Terry Rice
District Engineer
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Attn: Planning Division

FWS Log No.: 4-1-96-F-268
Project: Coast of Florida Study, Region III

Dear Colonel Rice:

The U.S. Fish and Wildlife Service (FWS) has reviewed the draft Feasibility Report for the Coast of Florida Erosion and Storm Effects Study, Region III submitted by the U.S. Army Corps of Engineers (COE). This letter represents the FWS' biological opinion on the effects of the planned actions within this report in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA). Effects of the planned actions on other resources such as nearshore reefs remain to be addressed in accordance with section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. *et seq.*).

This biological opinion programmatically addresses beach nourishment and renourishment in Region III. According to the COE's Biological Assessment (BA), separate biological opinions will be prepared for individual projects at a more advanced planning stage. This biological opinion is based on information provided from the following sources: the Feasibility Report, which includes a draft Environmental Impact Statement (DEIS), the BA for the Coast of Florida Study, Region III, from the Florida Department of Environmental Protection (FDEP), from Palm Beach, Broward, and Dade Counties, field investigations, previous biological opinions prepared for similar actions in the action area as well as other published and unpublished sources of information. A complete administrative record of this consultation is on file in the FWS' South Florida Ecosystem Office in Vero Beach, Florida.

CONSULTATION HISTORY

On October 5, 1995, the COE provided the FWS with a BA and a letter requesting formal consultation on threatened and endangered sea turtles as a result of the proposed actions associated with the Coast of Florida Study, Region III.

In a letter dated February 14, 1996, the FWS requested from the COE an estimate of the number of proposed projects which could be constructed within a single year. In this letter, the FWS notified the COE that formal consultation could not be initiated without this information.

In a letter dated March 28, 1996, the COE provided the FWS with the information requested above.

On July 9, 1996, the FWS notified the COE that the information provided is sufficient, formal consultation is initiated, and a biological opinion would be provided by August 23, 1996.

In August 1996, a revised DEIS for the Coast of Florida Study was received by the FWS.

BIOLOGICAL OPINION

Description of the proposed action

The Feasibility Report summarizes the COE's cooperative, cost-shared feasibility study on beach erosion and storm damage problems of the Atlantic Ocean shoreline along the southeast coast of Florida. The COE proposes to construct 27 shore protection projects consisting of beach nourishment, beach renourishment and sand transfer (See Table 1). These project segments span 93 kilometers of shoreline in Palm Beach, Broward and Dade Counties. Thirteen of these 27 projects have been previously authorized as Civil Works projects. Fourteen of the projects will require Congressional authorization.

Table 1. Project Plans Proposed in the Coast of Florida Study, Region III

Project Name	Project Type	Status
Bakers Haulover Inlet	0.1 Km Sand Transfer	New Project
Bal Harbour, Surfside, Miami Beach	14.3 Km Renourishment	Authorized Project
Boca Raton	2.3 Km Renourishment	Authorized Project
Dania Beach	1.0 Km Renourishment	New Project
Deerfield Beach	7.2 Km Renourishment	New Project
Delray Beach	4.3 Km Renourishment	Authorized Project
Fort Lauderdale	1.3 Km Renourishment	New Project
Golden Beach	1.8 Km Renourishment	New Project
Government Cut	0.3 Km Jetty Tightening	New Project
Highland Beach	5.1 Km Renourishment	New Project
Hillsboro Inlet	0.3 Km Sand Trap	New Project
Hollywood\Hallandale	8.5 Km Renourishment	Authorized
John U. Lloyd	3.7 Km Renourishment	Authorized
Jupiter\Juno Beach	4.8 Km Renourishment	Authorized Project
Key Biscayne	5.2 Km Renourishment	Authorized Project
Lake Worth Inlet	0.9 Km Sand Transfer	New Project
N. Palm Beach Island	3.0 Km Renourishment	Authorized Project
Ocean Ridge	2.4 Km Renourishment	Authorized Project
Palm Beach Island	4.3 Km Renourishment	Authorized Project
Pompano\Lauderdale by the Sea	8.5 Km Renourishment	Authorized
Port Everglades	.3 Km Sand Transfer	New Project
Port Everglades	Spur and Breakwater	New Project
Riviera Beach	1.7 Km Groin or Breakwater	New Project

Table 1. Project Plans Proposed in the Coast of Florida Study, Region III

Riviera Beach	2.7 Km Dune	New Project
S. Palm Beach Island	4.8 Km Renourishment	Authorized Project
So. Lake Worth Inlet	0.4 Km Sand Transfer	New Project
Sunny Isles	4.0 Km Renourishment	Authorized Project

Action Area

The action area for this Biological Opinion includes all shoreline where fill is proposed to be deposited or removed for transfer across an inlet, which amounts to 36 km of shoreline in Palm Beach County, 34 km in Broward County and 26.6 km in Dade County.

The COE has determined that the planned actions in the Coast of Florida Study, Region III may affect sea turtle nesting. Our records indicate that the threatened loggerhead sea turtle (*Caretta caretta*), as well as the endangered green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*) and hawksbill sea turtle (*Eretmochelys imbricata*), nest on the beaches in Palm Beach, Broward, and Dade Counties.

Status of the species

The FWS has responsibility for protecting sea turtles when they come ashore to nest. The National Marine Fisheries Service (NMFS) has responsibility over sea turtles in the marine environment. In applying the jeopardy standard under the ESA, the FWS has determined that sea turtle species occurring in the U.S. represent populations that qualify for separate consideration under section 7 of the ESA. Therefore, even though sea turtles are wide-ranging and have distributions outside the U.S., the FWS only considers the U.S. populations of sea turtles when making jeopardy or no jeopardy determinations under section 7.

The reproductive strategy of sea turtles involves producing large numbers of offspring to compensate for the high natural mortality through their initial years of life. For at least two decades, several human-caused mortality factors have contributed to the decline of sea turtle populations along the Atlantic coast and in the Gulf of Mexico (National Research Council 1990a). These factors include commercial over-utilization of eggs and turtles, incidental catches in commercial fishing operations, degradation of nesting habitat by coastal development, and marine pollution and debris. Therefore, human activities that affect the behavior and/or survivability of turtles on the remaining nesting beaches, particularly the few high density nesting beaches, could seriously reduce our ability to protect sea turtles.

Loggerhead sea turtle

The loggerhead sea turtle, which was listed as a threatened species on July 28, 1978 (43 FR 32800), inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. Loggerhead sea turtles nest within the continental U.S. from Louisiana to Virginia. Major nesting concentrations in the U.S. are found on the coastal islands of North Carolina, South Carolina, and Georgia, and on the Atlantic and Gulf coasts of Florida (Hopkins and Richardson 1984). Total estimated nesting in the southeastern U.S. is approximately 50,000 to 70,000 nests per year (NMFS and FWS 1991b).

From a global perspective, the southeastern U.S. nesting aggregation is of paramount importance to the survival of the species and is second in size only to the population that nests on islands in the Arabian Sea off of Oman (Ross 1982, Ehrhart 1989, NMFS and FWS 1991b). The status of the Oman colony has not been evaluated recently, but its location in a part of the world that is vulnerable to disruptive events (e.g., political upheavals, wars, catastrophic oil spills) is cause for considerable concern (Meylan *et al.* 1995). The loggerhead nesting aggregations in Oman, the southeastern U.S., and Australia account for about 88 percent of nesting worldwide (NMFS and FWS 1991b). About 80 percent of loggerhead nesting in the southeastern U.S. occurs in six Florida counties: Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward (NMFS and FWS 1991b).

Recent genetic analyses using restriction fragment analysis and direct sequencing of mitochondrial DNA have been employed to resolve management units among loggerhead nesting cohorts of the southeastern U.S. (Bowen *et al.* 1993; B.W. Bowen, University of Florida, Gainesville, in litt., November 17, 1994, and October 26, 1995). Assays of nest samples from North Carolina to the Florida Panhandle have identified three genetically distinct nesting populations: (1) northern nesting population - Hatteras, North Carolina, to Cape Canaveral, Florida; (2) South Florida nesting population - Cape Canaveral to Naples, Florida; and (3) Florida Panhandle nesting population - Eglin Air Force Base and the beaches around Panama City, Florida. These data indicate that gene flow between the three regions is very low. If nesting females are extirpated from one of these regions, regional dispersal will not be sufficient to replenish the depleted nesting population (Bowen *et al.* 1993, B.W. Bowen, University of Florida, Gainesville, in litt., October 26, 1995).

Green sea turtle

The green sea turtle, which was listed as an endangered species on July 28, 1978 (43 FR 32800), has a worldwide distribution in tropical and subtropical waters. Major green sea turtle nesting colonies in the Atlantic Ocean occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Breeding populations of the green sea turtle in Florida and along the Pacific coast of Mexico are listed as endangered; all other populations are listed as threatened.

Within the U.S., green sea turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (NMFS and FWS 1991a). Nesting also has been documented along the Gulf coast of Florida on Santa Rosa Island (Okaloosa and Escambia Counties) and from Pinellas County through Collier County (FDEP, unpublished data).

Green sea turtles have been known to nest in Georgia, but only on rare occasions (Georgia Department of Natural Resources, unpub. data) and they nest sporadically in North Carolina (North Carolina Wildlife Resources Commission, unpublished data). No green sea turtle nesting has been documented in South Carolina (S. Murphy, South Carolina Department of Natural Resources, in litt., November 8, 1995). Unconfirmed nesting of green sea turtles in Alabama has been reported (R. Dailey, Bon Secour National Wildlife Refuge, personal communication).

Leatherback sea turtle

The leatherback sea turtle, which was listed as an endangered species on June 2, 1970 (35 FR 8491), is found in the Atlantic, Pacific and Indian Oceans. Leatherback sea turtles have been recorded as far north as Labrador and Alaska and as far south as Chile and the Cape of Good Hope. Nesting grounds are distributed circumglobally, with the Pacific Coast of Mexico supporting the world's largest known concentration of nesting leatherbacks. The largest nesting colony in the wider Caribbean region is found in French Guiana, but nesting occurs frequently, although in lesser numbers, from Costa Rica to Columbia and in Guyana, Surinam, and Trinidad (NMFS and FWS 1992, National Research Council 1990a).

Leatherback sea turtles regularly nest in the U.S. in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia (NMFS and FWS 1992). Leatherback turtles have been known to nest in Georgia and South Carolina, but only on rare occasions (Georgia and South Carolina Departments of Natural Resources, unpublished data). Leatherback nesting also has been reported on the west coast of Florida on St. Vincent National Wildlife Refuge (LeBuff 1990), St. Joseph Peninsula State Park (FDEP, unpublished data), and St. George Island (T. Lewis, St. Vincent National Wildlife Refuge, personal communication); a false crawl (non-nesting emergence) has been observed on Sanibel Island (LeBuff 1990).

Hawksbill sea turtle

The hawksbill sea turtle, which was listed as an endangered species on June 2, 1970 (35 FR 8491), is found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean. Within the continental U.S., hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Dade Counties) and the Florida Keys in Monroe County (Meylan 1992, Meylan *et al.* 1995). Hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by surveyors. Therefore, surveys in Florida probably underestimate actual hawksbill nesting numbers (Meylan *et al.* 1995). In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (NMFS and FWS 1993).

ENVIRONMENTAL BASELINE

Status of the species in the action area

A. Nesting within Region III compared to nesting statewide

The following discussion of sea turtle nesting within Palm Beach, Broward, and Dade Counties, as well as comparisons to statewide nesting trends, was derived from data provided by Meylan *et al.* (1995) and Meylan (unpublished data). Meylan *et al.* (1995) tabulates the results of nesting surveys throughout Florida between 1979 and 1992. Unpublished data are available for the 1993 and 1994 nesting seasons.

Approximately 25 percent of Florida's sea turtle nesting occurs annually in the tri-county area known as Region III. During the nesting seasons from 1979 to 1992, loggerhead sea turtles laid 21.8 percent of their nests within Region III; green sea turtles laid 28.4 percent; and leatherbacks laid 54.7 percent. Hawksbill sea turtles reportedly laid 64 percent of their nests on Region III beaches; however, total nesting activity was low (11 nests state-wide) and this high percentage could be due to factors other than regional nesting preference.

Statewide and within Region III of the Coast of Florida Study, loggerhead sea turtle nests account for the vast majority of reported nesting (97.9 and 95.1 percent, respectively, from 1979 to 1992). During this same period, green sea turtle nests amounted to 0.2 percent of nesting state-wide and 4.2 percent within Region III. Nesting totals for each species differ substantially. From 1988 to 1992, while survey efforts remained relatively constant, the total number of reported loggerhead nests state-wide fluctuated between

37,242 and 68,614. Green sea turtle nests were reported to fluctuate between 455 and 2,509 during the same period. While totals differ, the distributions of loggerhead and green sea turtle nests follow a similar pattern on the east coast of Florida.

The most nesting activity by both species occurred outside of the action area to the north in Brevard County. Loggerhead and green sea turtles laid 39.4 percent and 39.5 percent, respectively, of their nests in Brevard County. Palm Beach County supported the second highest percentage of nests for both species with 17.8 percent of loggerhead nests and 23.1 percent of green sea turtle nests.

Broward County was sixth in importance as a nesting location for both species. Loggerhead sea turtles laid 3.4 percent of their nests here between 1979 and 1982 and green sea turtles laid 5.0 percent of their nests in Broward County during the same period. Dade County had a small but significant proportion of nests (0.6 for loggerheads and 0.3 for greens) from 1979 to 1992.

Between 1988 and 1992, annual reported leatherback sea turtle nests varied between 98 and 188 state-wide. The distribution of these nests differs from the loggerhead and green sea turtle nests discussed above. Leatherback nests have a center of distribution at Palm Beach County which supports more than half (50.1 percent) of the total nests reported state-wide. To the north, Martin and St. Lucie County beaches have been the site of 27.7 percent and 13.2 percent of leatherback nests, respectively. South of Palm Beach County, the number of leatherback nests declines more sharply. Broward County supported 3.0 percent of leatherback nesting and Dade County supported 1.6 percent.

The hawksbill sea turtles nest so rarely in Florida (only 11 nests reported state-wide from 1979 to 1992) that no distinct pattern of distribution is apparent. However, the majority (7) of those reported nestings have occurred within the Region III area. One hawksbill nest was reported from Palm Beach County in 1985 and two in 1992, one in Broward County in 1986, and one in 1981 and two in 1990 in Dade County.

B. Nesting within Region III

The average number of nests annually of each species within each Region III county are shown in Table 2. These data show that Palm Beach County is clearly the most important nesting location within the region for the endangered leatherback and green sea turtles. Less evident from Table 2 is the fact that as the total number of nests for these species declines from north to south, so too does the percentage that these nests contribute to total nesting activity. Green sea turtles lay 4.3 percent of total nests in Palm Beach and Broward Counties, but only 0.5 percent of the total in Dade County. Similarly, leatherback nests constitute 0.8 percent of the total in Palm Beach County but only 0.4 and 0.5 percent in Broward and Dade Counties, respectively.

Table 2. Average annual number of nests by county from 1992 to 1994

	Loggerhead	Green	Leatherback	Hawksbill
Palm Beach	12,133	544	99	1
Broward	2,226	101	11	0
Dade	401	2	2	0

C. Nesting activity trends in Region III

Throughout the state, the number of sea turtle nests (all species) per kilometer surveyed from 1979 to 1992 appears to have increased slightly. Loggerhead nest numbers vary enough from year to year to prevent Meylan *et al.* (1995) from drawing a firm conclusion that loggerhead nesting is increasing (see Figure 1). Kilometers surveyed increased as the study progressed, thus, the figures become increasingly reliable. It appears that loggerhead nesting activity could be on a four year cycle. Figure 1 shows peaks in nesting density for 1982, 1986, and 1990. Similarly, green sea turtle nesting exhibits a two year cycle in activity.

A trend toward increasing loggerhead nesting within Region III appears more evident as seen in Figure 2. The contribution from each county to each year's loggerhead nesting activity can be approximated by reviewing Table 2. All counties have a similar trend.

Dissimilar trends in green sea turtle nesting among Palm Beach, Broward, and Dade Counties occurred from 1979 to 1994. Nesting activity for each year by county is shown in Figure 3.
The figure above shows a pronounced increase in green sea turtle nesting in Palm Beach County from 1990 to 1994. The phenomenon of higher nesting activity in alternating years can easily be seen in the years 1990, 1992, and 1994. This pattern can also be seen in the Broward County data. The trend toward increasing green sea turtle nesting activity over the long term is also clear from the figure. Dade County, however, shows a decrease in reported green sea turtle nesting per kilometer. Except in 1980, the number of nests per kilometer in Dade County is low, which could be due to random fluctuations in nesting activity. Meylan *et al.* (1995) report that an increase in green sea turtle nesting has been observed statewide. We do not know the reason for this increase is unknown and regard it with cautious optimism.

Figure 1: Average number of loggerhead nests per kilometer surveyed in Florida from 1979 to 1992

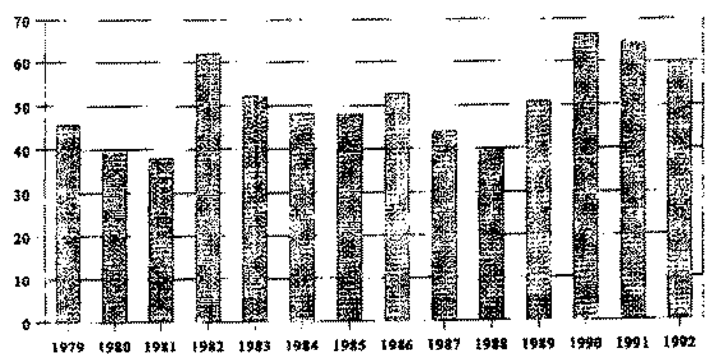


Figure 3. Green sea turtle nesting per kilometer surveyed for Dade, Broward and Palm Beach Counties, 1979 to 1994

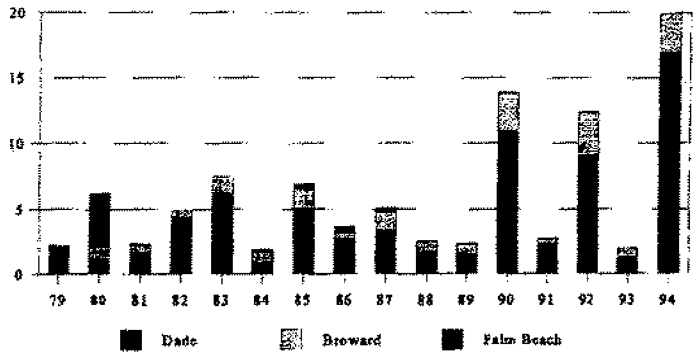
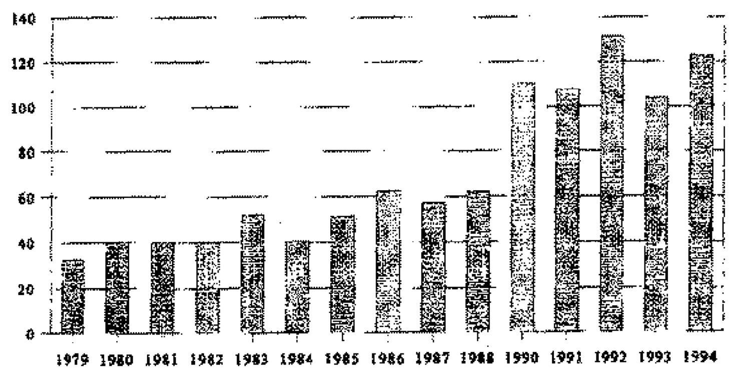


Figure 2. Average number of loggerhead nests per kilometer surveyed in Palm Beach, Broward, and Dade Counties, Florida, from 1979 to 1994



Leatherback nesting has fluctuated widely during the survey period between 1979 and 1994. In Palm Beach County, where the most leatherback nesting occurs, the reported nesting densities for the period vary from 0.3 nests per kilometer in 1980 to 2.3 nests per kilometer in 1994. A peak in nesting density occurred in 1983 when 1.8 nests per kilometer were reported. From 1979 to 1994, 735 leatherback nests were reported from Palm Beach County; Broward County reported 109 nests and Dade County reported 15 leatherback nests.

In Broward County, there is not a clear trend in leatherback nesting activity. Nests per kilometer ranged from 0.0 in 1990 to 0.7 in 1987. Nesting by leatherbacks in Dade County is too low to exhibit discernable trends.

No trends in nesting activity are evident in nesting frequency by the hawksbill sea turtle. As previously stated, however, seven hawksbill nests out of the 11 reported statewide from 1979 to 1994 were from Region III counties. Underreporting of hawksbill nests undoubtedly occurs as a result of their extended nesting season. Most seasonal beach surveys end in the late summer or early fall. Thus, hawksbill nests laid in late fall or early winter would not be included in the survey. Underreporting of leatherback nesting also occurs because leatherbacks begin nesting prior to the beginning of annual beach surveys. The nesting and hatching seasons for each species within Region III are given on the following page.

Species	Nesting and Hatching Dates
Loggerhead sea turtle	March 15 to November 30
Green sea turtle	May 1 to November 30
Leatherback sea turtle	February 15 to November 15
Hawksbill sea turtle	June 1 to December 31

D. Nest relocation

With few exceptions, most sea turtle nests are relocated from the beaches where they are laid in Broward and Dade Counties. This is done to protect the eggs and hatchlings from harm due to the high degree of human activity on these beaches. Most areas within these two counties are densely developed with multi-family residential (condominiums) and resort (hotels) development. The Atlantic shoreline at Golden Beach, Dade County and Hillsboro Beach, Broward County is developed with single-family residential development; public access and lighting are minimized. In these locations, nests are left *in situ*. Many of the Broward County nests are relocated to Hillsboro Beach. Nests are also left *in situ* at John U. Lloyd State Park, Broward County.

Both Broward and Dade Counties have been successful in hatching young loggerhead and green sea turtles from relocated nests. Broward County (1995) reports a 72.0 percent rate of hatching success for 1687 relocated nests. The 419 nests left *in situ* and monitored had a 76.6 percent hatching success rate. A significant fraction of the relocated nests (14) were laid by green turtles. Green turtle egg ciability was greatly reduced by relocation. Only 55.6 percent of relocated green turtle eggs hatched while 76.1 percent of *in situ* green turtle eggs hatched successfully. Results in Dade County were similar. For the 326 relocated loggerhead nests, there was a 79.3 percent successful hatch rate. For the 29 *in situ* nests, the rate of successful hatching was 73.3 percent (Steve Blair, personal communication).

E. Nesting activity within each project area

All of the areas proposed for renourishment include some suitable nesting habitat. However, the proposed projects will not be constructed for many years and the suitability of each area for sea turtle nesting will likely change in this timeframe. Thus, the FWS will address the effect of individual projects on sea turtle nesting within each project area in later biological opinions.

EFFECTS OF THE PROPOSED ACTION

Since 1988, approximately 15 miles of shoreline have been renourished in Region III. These previously authorized projects have had a substantial effect on sea turtle nesting. The new proposed projects would add to these effects by increasing incidental take due to nest relocation during construction, through missed nests, and through changes in the nesting environment after project construction. Conversely, nesting habitat within Region III will be increased over that which would exist without beach nourishment and renourishment.

A. Direct effects

Although beach nourishment may increase the potential nesting area, sea turles may be adversely affected if protective measures are not incorporated into project planning and implementation. Placement of sand on an eroded section of beach or an existing beach, in an of itself, is not likely to provide suitable nesting habitat for sea turtles.

Nourishment and sand transfer during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of offspring from human-caused mortality and may significantly affect the long-term survival of the species. For instance, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. While a nest monitoring and egg relocation program would reduce these effects, nests may be inadvertently missed or misidentified as false crawls during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed. Even under the best conditions, about seven percent of the nests can be missed by experienced turtle nest surveyors (Schroeder 1994).

1. Nest relocation

Besides the potential for missing nests during a relocation program, there is a potential for eggs to be damaged by their movement or for unknown biological mechanisms to be affected. Nest relocation can have adverse effects on incubation temperature (hence, sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus *et al.* 1979, Ackerman 1980, Parmenter 1980, Spotila *et al.* 1983, McGehee 1990). Relocating nests into sand deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings. Water availability is known to influence the incubation environment of the embryos and hatchlings of turtles with flexible-shelled eggs, which has been shown to affect nitrogen excretion (Packard *et al.* 1984), mobilization of calcium (Packard and Packard 1986), mobilization of yolk nutrients (Packard *et al.* 1985), hatchling size (Packard *et al.* 1981, McGehee 1990), energy reserves in the yolk at hatching (Packard *et al.* 1988), and locomotory ability of hatchlings (Miller *et al.* 1987).

FDEP has noted significant variations in comparing hatching success and emergence success between *in situ* and relocated nests (unpublished data). In a 1994 study, Meylan (unpulished data) found variations of hatching and emergence success of *in situ* and relocated nests at seven sites in Florida. Hatching success was lower for relocated nests in five of seven cases with an average decrease for all seven sites of 5.01 percent (16.31 percent decrease ↔ 7.19 percent increase). Emergence success was lower for relocated nests in all seven cases by an average of 11.67 percent (23.36 percent decrease ↔ 3.6 percent decrease).

A final concern with nest relocation is that it may concentrate eggs in an area resulting in a greater susceptibility to catastrophic events. Hatchlings released from concentrated areas may be subject to greater predation rates from both land and marine predators, who have adapted to concentrate their foraging efforts.

2. Equipment
The placement of pipelines and the use of heavy machinery on the beach during a construction project may also have adverse effects on sea turtles. They can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure.

3. Changes in the physical environment
Beach nourishment may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand (Nelson and Dickerson 1988a). These changes could result in adverse effects on nest site selection, digging behavior, clutch viability, and emergence by hatchlings (Nelson and Dickerson 1987, Nelson 1988).

4. Compaction
Beach compaction and unnatural beach profiles that may result from beach nourishment activities could adversely affect sea turtles regardless of the timing of the projects. Very fine sand and/or the use of heavy machinery can cause sand compaction on nourished beaches (Nelson *et al.* 1987, Nelson and Dickerson 1988a). Significant reductions in nesting success have been documented on severely compacted nourished beaches (Fletemeyer 1980, Raymond 1984, Nelson and Dickerson 1987, Nelson *et al.* 1987). Increased false crawls result in increased physiological stress to nesting females. Sand compaction may increase the length of time required for female sea turtles to excavate nests, again, causing increased physiological stress to the animals (Nelson and Dickerson 1988c). These effects can be minimized by using suitable sand and by tilling the beach after nourishment. Nelson and Dickerson (1988b) concluded that, in general, beaches nourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and accretion of sand, others may remain hard for 10 years or more.

5. Escarpments
On nourished beaches, steep escarpments may develop along their water line interface as they adjust from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984, Nelson *et al.* 1987). These escarpments can hamper or prevent access to nesting sites. Female turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (e.g., in front of the escarpments which often results in failure of nests due to tidal inundation). This effect can be minimized by leveling the beach prior to the nesting season.

6. Sediment color
A change in sediment color on a beach could change the natural incubation temperatures of nests in an area which, in turn, could alter natural sex ratios. To provide the most suitable sediment for nesting sea turtles, the color of the nourished sediments must resemble the natural beach sand in the area. Natural reworking of sediments and bleaching from exposure to the sun would help to lighten dark nourishment sediments; however, the time frame for sediment mixing and bleaching to occur could be critical to a successful sea turtle nesting season.

7. Disorientation

Another effect to sea turtles is disorientation (loss of bearings) and misorientation (incorrect orientation) of hatchlings from artificial lighting. Visual cues are the primary sea-finding mechanism for hatchlings (Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). Artificial beachfront lighting is a well documented cause of hatchling disorientation and misorientation on nesting beaches (Philbosian 1976, Mann 1977, FDEP unpublished data). In addition, research has also documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights (Witherington 1992). Therefore, construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, disorient females trying to return to the surf after a nesting event, and disorient and misorient emergent hatchlings from adjacent non-project beaches. Any source of bright lighting can profoundly affect the orientation of hatchlings, both during the crawl from the beach to the ocean and once they begin swimming offshore. Hatchlings attracted to light sources on dredging barges may not only suffer from interference in migration, but may also experience higher probabilities of predation to predatory fishes that are also attracted to the barge lights. This effect could be reduced by using the minimum amount of light necessary, require shielding or use low pressure sodium lighting during project construction.

B. Indirect effects

Future erosion of nesting beaches is a potential indirect effect of nourishment projects on sea turtles. Dredging sand offshore from a project area has the potential to cause erosion of the newly created beach or other areas on the same or adjacent beaches by creating a sand sink. The remainder of the beach system responds to this sand sink by providing sand from the beach in an attempt to reestablish equilibrium (National Research Council 1990b).

C. Cumulative effects

Cumulative effects include the effects of future State, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Construction of all of the beach segments proposed in the Coast of Florida Study would have significant cumulative effects on sea turtle nesting in Region III. Approximately 60 miles of shoreline are proposed for construction out of a total of 93 miles. However, not all of the proposed project segments will be built at or near the same time. According to past construction schedules, four or five project segments could be constructed in a single year. As these constructed segments erode, other segments will be constructed. This cycle of erosion and renourishment will be repeated at various locations within the region resulting in little net gain of dry beach throughout the region. Some of the proposed projects may never be constructed. The net cumulative effect will be the additive incidental take of sea turtle nests and eggs due to relocation and burial of missed nests due to repetitive construction of beach projects. However, the annual rate of this incidental take, with precautions, should be low enough to remain within limits that are acceptable to the FWS.

CONCLUSION

After reviewing the current status of the loggerhead, green, leatherback and hawksbill sea turtles, the environmental baseline for the action area, the effects of the proposed beach nourishments, and the cumulative effects, it is the FWS' biological opinion that the planned actions in the Coast of Florida Study, Region III, as proposed, are not likely to jeopardize the continued existence of the sea turtles listed above.

No critical habitat has been designated for the loggerhead or green sea turtles. Critical habitat has been designated for leatherback sea turtles (St. Croix, U.S. Virgin Islands) and for hawksbill sea turtles (Mona, Culebrita, and Culebra Islands, Puerto Rico). These proposed actions do not affect those areas, thus, there is no effect on designated critical habitat for these two species.

INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of the ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The COE has a continuing duty to regulate the activity covered by this incidental take statement. If the COE (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or extent of incidental take

Broward County and Palm Beach County (excluding sand transfer plants)

The FWS has reviewed the biological information and other information relevant to this action. Based on this review, incidental take is anticipated for all sea turtle nests that may be constructed and eggs that may be deposited from March 1 through April 30 and from September 1 through September 30 and missed by a nest survey and egg relocation program within the boundaries of the seventeen proposed fill projects. Incidental take is also anticipated for all sea turtle nests deposited from October 1 through February 28 (or 29 as applicable) when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project. Without the prescribed precautions, this take could equal 250 missed nests and 27,000 eggs rendered inviable through relocation annually.

Dade County and Palm Beach County sand transfer plants

The FWS has reviewed the biological information and other information relevant to this action. Based on this review, incidental take is anticipated for all sea turtle nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the proposed projects. Incidental take is also anticipated for all sea turtle nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project.

Effect of the take

In the accompanying biological opinion, the FWS determined that this level of anticipated take is not likely to result in jeopardy to the species.

Reasonable and prudent measures

Broward County and Palm Beach County (excluding sand transfer plants)

The FWS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of loggerhead, green, leatherback and hawksbill sea turtles in Broward and Palm Beach Counties.

1. Only beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence shall be used on the project site.

2. Beach nourishment activities shall not occur from May 1 through October 31, the period of peak sea turtle egg laying and egg hatching, to reduce the possibility of sea turtle nest burial or crushing of eggs.

3. If the beach nourishment project will be conducted during the period from March 1 through April 30, surveys for early nesting sea turtles shall be conducted. If these surveys find nests in a beach nourishment area, the eggs of those nests shall be relocated.

4. If the beach nourishment project will be conducted during the period from November 1 through November 30, surveys for late nesting sea turtles shall be conducted. If these surveys find nests in a beach nourishment area, the eggs of those nests shall be relocated.

5. Immediately after completing a beach nourishment project and prior to the next three nesting seasons, beach compaction shall be monitored and tilling shall be conducted by March 1, as required, to reduce the likelihood of affecting sea turtle nesting and hatching activities. The March 1 deadline is required to reduce adverse effects to leatherbacks that nest in greater frequency along the South Atlantic coast of Florida than elsewhere in the contiguous United States.

6. Immediately after completion of the beach nourishment project and prior to the next three nesting seasons, monitoring shall be conducted to determine if escarpments are present and escarpments shall be leveled as required to reduce the likelihood of affecting sea turtle nesting and hatching activities.

7. The COE shall ensure that contractors doing the beach nourishment work fully understand the sea turtle protection measures detailed in this incidental take statement.

8. During the early and late portions of the nesting season, construction equipment and pipes shall be stored in a manner that will minimize effects to sea turtles to the maximum extent practicable.

9. During the early and late portions of the nesting season, lighting associated with the project shall be minimized to reduce the possibility of disrupting and disorienting nesting and/or hatchling sea turtles.

Dade County and all sand transfer plants

The FWS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of loggerhead, green, leatherback, and hawksbill sea turtles in Dade County and at the site of all sand transfers.

1. Only beach-quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence shall be used on the project site.

2. If a beach nourishment project or sand transfer will be conducted during the sea turtle nesting season, surveys for nesting sea turtles shall be conducted. If these surveys find nests in the beach nourishment or sand transfer areas, including the area from which sand will be transferred, the eggs of those nests shall be relocated.

3. Immediately after completion of a nourishment or transfer of sand and prior to the next three nesting seasons, beach compaction shall be monitored and tilling shall be conducted, as required, to reduce the likelihood of affecting sea turtle nesting and hatching activities.

4. Immediately after completion of the beach nourishment or transfer of sand and prior to the next three nesting seasons, monitoring shall be conducted to determine if escarpments are present and escarpments shall be leveled as required to reduce the likelihood of affecting sea turtle nesting and hatching activities.

5. The COE shall ensure that contractors doing the beach nourishment or transfer work fully understand the sea turtle protection measures detailed in this incidental take statement.

6. During the sea turtle nesting season, construction equipment and pipes shall be stored in a manner that will minimize effects to sea turtles to the maximum extent practicable.

7. During the sea turtle nesting season, lighting associated with the project shall be minimized to reduce the possibility of disrupting and disorienting nesting and/or hatchling sea turtles.

Terms and conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the COE must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

Broward County and Palm Beach County (excluding sand transfer plants)

1. Fill material placed on the beach shall be sand that is similar to that already existing at the beach site in both coloration and grain size. All such fill material shall be free of construction debris, rocks, or other foreign matter and shall not contain, on average, greater than 10 percent fines (i.e., silt and clay) passing a No. 200 sieve and shall not contain, on average, greater than 5 percent coarse gravel or cobbles, exclusive of shell material retained by a No. 4 sieve.

2. Beach nourishment shall be started after October 31 and be completed before May 1. During the May 1 through October 31 period, no construction equipment or pipes shall be stored on the beach.

3. If the beach nourishment project will be conducted during the period from March 1 through April 30, daily early morning surveys for sea turtle nests shall be conducted within the period from March 1 through April 30 that the project is being conducted, and eggs shall be relocated per the following requirements.

    a. Nest surveys and egg relocations shall only be conducted by personnel with prior experience and training in nest survey and egg relocation procedures. Surveyors shall have a valid FDEP permit. Nest surveys shall be conducted daily between sunrise and 9 a.m. Surveys shall be performed in such a manner that ensures that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

    b. Only those nests that may be affected by construction activities shall be relocated. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests. Nests deposited within areas where construction activities have ceased or will not occur for 65 days shall be marked and left in place unless other factors threaten the success of the nest. Any nests left in the active construction zone shall be clearly marked, and all mechanical equipment shall avoid nests by at least 10 feet.

4. If the beach nourishment project will be conducted during the period from November 1 through November 30, daily early morning surveys for sea turtle nests shall be conducted 65 days prior to project initiation and continue through September 30, and eggs shall be relocated in accordance with the requirements outlined above.

5. Immediately after completion of the beach nourishment project and prior to March 1 for three subsequent years, sand compaction shall be monitored in the area of restoration in accordance with protocol agreed to by the FWS, the FDEP, and the applicant. At a minimum, the protocol provided under 5a and 5b (below) shall be followed. If required, the area shall be tilled to a depth of 36 inches. All tilling activity must be completed prior to March 1. A report on the results of compaction monitoring shall be submitted to the FWS prior to any tilling actions being taken. An annual summary of compaction surveys and the actions taken shall be submitted to the FWS. This condition shall be evaluated annually and may be modified, if necessary, to address sand compaction problems identified during the previous year.

    a. Compaction sampling stations shall be located at 500-foot intervals along the project area. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area); one station shall be midway between the dune line and the high water line (normal wrack line); and one station shall be located just landward of the high water line. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lay over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports shall include all 27 values for each transect line, and the final nine averaged compaction values.

b. If the average value for any depth exceeds 500 poundes per square inch (psi) for any two or more adjacent stations, then that area shall be tilled prior to March 1. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the FWS shall be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling shall not be required.

6. Visual surveys for escarpments along the project area shall be made immediately after completion of the beach nourishment project and prior to March 1 for three subsequent years. Results of the surveys shall be submitted to the FWS prior to any action being taken. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled to the natural beach contour by March 1. The FWS shall be contacted immediately if subsequent reformation of escarpments that can interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the FWS will provide a brief written authorization that describes methods to be used to reduce the likelihood of affecting existing nests. An annual summary of escarpment surveys and actions taken shall be submitted to the FWS.

7. The COE shall arrange a meeting between representatives of the contractor, the FWS, the FDEP, and the permitted person responsible for egg relocation at least 30 days prior to the commencement of work on this project. At least 10 days advance notice shall be provided prior to conducting this meeting. This will provide an opportunity for explanation and/or clarification of the sea turtle protection measures.

8. From March 1 through April 30 and November 1 through November 30, staging areas for construction equipment shall be located off the beach to the maximum extent practicable. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes that are placed on the beach shall be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Temporary storage of pipes shall be off the beach to the maximum extent possible. Temporary storage of pipes on the beach shall be in such a manner so as to affect the least amount of nesting habitat and shall likewise not compromise the integrity of the dune systems (placement of pipes perpendicular to the shoreline is recommended as the method of storage).

9. From March 1 through April 30 and November 1 through November 30, all on-beach lighting associated with the project shall be limited to the immediate area of active construction only. Such lighting shall be shielded low pressure sodium vapor lights to minimize illumination of the nesting beach and nearshore waters. Red filters should be placed over vehicle headlights (i.e., bulldozers, front-end loaders). Lighting on offshore equipment shall be similarly minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all U.S. Coast Guard and OSHA requirements. Shielded low pressure sodium vapor lights are highly recommended for lights on offshore equipment that cannot be eliminated.

10. A report describing the actions taken to implement the terms and conditions of this incidental take statement shall be submitted to the South Florida Ecosystem Office within 60 days of completion of the proposed work for each year when activity has occurred. Each report shall include the dates of actual construction activities, names and qualifications of personnel involved in nest surveys and relocation activities, descriptions and locations of hatcheries, nest survey and relocation results, and hatching success of nests.

11. In the event a sea turtle nest is excavated during construction activities, the permitted person responsible for egg relocation for the project should be notified so the eggs can be moved to a suitable relocation site.

12. Upon locating a dead, injured, or sick threatened or endangered sea turtle specimen, initial notification must be made to the FWS' Law Enforcement Office in Miami, Florida, at (305) 526-2789. Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

Dade County and all sand transfer plants

1. Material placed on the beaches shall be sand that is similar to that already existing at the beach site in both coloration and grain size. All such fill material shall be free of construction debris, rocks, or other foreign matter and shall generally not contain, on average, greater than 10 percent fines (i.e., silt and clay) passing a No. 200 sieve and shall not contain, on average, greater than 5 percent coarse gravel or cobbles, exclusive of shell material retained by a No. 4 sieve.

2. Daily early morning surveys shall be required if any portion of the beach nourishment project occurs during the period from April 1 to November 30. Nesting surveys shall be initiated 65 days prior to nourishment activities or by April 1, whichever is later. Nesting surveys shall continue through the end of the project or through September 30, whichever is earlier. If these surveys find nests in areas where they may be affected by construction activities, the eggs of those nests shall be relocated per the following requirements:

    a. Nest surveys and egg relocations shall only be conducted by personnel with prior experience and training in nest survey and egg relocation procedures. Surveyors shall have a valid FDEP permit. Nest surveys shall be conducted daily between sunrise and 9 a.m. Surveys shall be performed in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

b. Only those nests that may be affected by construction or sand transfer activities shall be relocated. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests. Nests deposited within areas where construction activities have ceased or will not occur for 65 days shall be marked and left in place unless other factors threaten the success of the nest. Any nests left in the active construction zone shall be clearly marked, and all mechanical equipment shall avoid nests by at least 10 feet.

3. Immediately after completion of the beach nourishment project or sand transfer and prior to April 1 for three subsequent years, sand compaction shall be monitored in the area of restoration in accordance with a protocol agreed to by the FWS, the FDEP, and the applicant. At a minimum, the protocol provided under 3a and 3b below shall be followed. If required, the area shall be tilled to a depth of 36 inches. All tilling activity must be completed prior to April 1. If the project is completed during the nesting season, tilling shall not be performed in areas where nests have been left in place or relocated. A report on the results of compaction monitoring shall be submitted to the FWS prior to any tilling actions being taken. An annual summary of compaction surveys and the actions taken shall be submitted to the FWS. This condition shall be evaluated annually and may be modified if necessary to address sand compaction problems identified during the previous year.

a. Compaction sampling stations shall be located at 500-foot intervals along the project area. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area); one station shall be midway between the dune line and the high water line (normal wrack line); and one station shall be located just landward of the high water line. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lay over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports shall include all 27 values for each transect line, and the final nine averaged compaction values.

b. If the average value for any depth exceeds 500 psi for any two or more adjacent stations, then that area shall be tilled immediately prior to April 1. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Fish and Wildlife Service shall be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling shall not be required.

4. Visual surveys for escarpments along the project area shall be made immediately after completion of the beach nourishment project and prior to April 1, for three subsequent years. Results of the surveys shall be submitted to the FWS prior to any action being taken. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled to the natural beach contour by April 1. If the project is completed during the sea turtle nesting and hatching season, escarpments may be required to be leveled immediately, while protecting

nests that have been relocated or left in place. The FWS shall be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the FWS will provide a brief written authorization that describes methods to be used to reduce the likelihood of affecting existing nests. An annual summary of escarpment surveys and actions taken shall be submitted to the FWS.

5. The COE shall arrange a meeting between representatives of the contractor, the FWS, the FDEP and the permitted person responsible for egg relocation at least 30 days prior to the commencement of work on this project. At least 10 days advance notice shall be provided prior to conducting this meeting. This will provide an opportunity for explanation and/or clarification of the sea turtle protection measures.

6. From April 1 to November 30, staging areas for construction equipment shall be located off the beach to the maximum extent practicable. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes that are placed on the beach shall be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Temporary storage of pipes shall be off the beach to the maximum extent possible. Temporary storage of pipes on the beach shall be in such a manner so as to affect the least amount of nesting habitat and shall likewise not compromise the integrity of the dune systems (placement of pipes perpendicular to the shoreline is recommended as the method of storage).

7. From April 1 to November 30, all on-beach lighting associated with the project shall be limited to the immediate area of active construction only. Such lighting shall be shielded low pressure sodium vapor lights to minimize illumination of the nesting beach and nearshore waters. Red filters should be placed over vehicle headlights (i.e., bulldozers, front-end loaders). Lighting on offshore equipment shall be similarly minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all U.S. Coast Guard and OSHA requirements. Shielded low pressure sodium vapor lights are highly recommended for lights on offshore equipment that cannot be eliminated.

8. A report describing the actions taken to implement the terms and conditions of this incidental take statement shall be submitted to the South Florida Ecosystem Office within 60 days of completion of the proposed work for each year when activity has occurred. Each report will include the dates of actual construction activities, names and qualifications of personnel involved in nest surveys and relocation activities, descriptions and locations of hatcheries, nest survey and relocation results, and hatching success of nests.

9. In the event a sea turtle nest is excavated during construction activities, the permitted person responsible for egg relocation for the project should be notified so the eggs can be moved to a suitable relocation site.

10. Upon locating a dead, injured, or sick threatened or endangered sea turtle specimen, initial notification must be made to the FWS' Law Enforcement Office in Miami, Florida, at (305) 526-2789. Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or

threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. With implementation of these measures, the FWS believes that no more than those sea turtle nests and eggs that may be missed by a nest survey and egg relocation program, or those laid during the period when an egg relocation program is not required, will be incidentally taken. The FWS estimates this annual take to be three nests which may be missed by surveyors and 270 eggs rendered inviable by relocation. If, during the course of the action, this minimized level of incidental take is exceeded, such incidental take represents new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the FWS the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

Palm Beach County and Broward County

1. Appropriate native salt-resistant dune vegetation should be established on the restored dunes. The FDEP's Bureau of Beaches and Coastal Systems can provide technical assistance on the specifications for design and implementation.

2. Surveys for nesting success of sea turtles should be continued for a minimum of three years following beach nourishment to determine whether sea turtle nesting success has been adversely affected.

3. Educational signs should be placed where appropriate at beach access points explaining the importance of the area to sea turtles and/or the life history of sea turtle species that nest in the area.

Dade County

1. Construction activities for this project and similar future projects should be planned to take place outside the main part of the sea turtle nesting and hatching season.

2. Appropriate native salt-resistant dune vegetation should be established on the restored dunes. The FDEP's Bureau of Beaches and Coastal Systems can provide technical assistance on the specifications for design and implementation.

3. Surveys for nesting success of sea turtles should be continued for a minimum of three years following beach nourishment to determine whether sea turtle nesting success has been adversely affected.

4. Educational signs should be placed where appropriate at beach access points explaining the importance of the area to sea turtles and/or the life history of sea turtle species that nest in the area.

In order for the FWS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the FWS requests notification of the implementation of any conservation recommendations.

REINITIATION

This concludes formal consultation on the action(s) outlined in the initiation request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation in the effort to protect threatened and endangered sea turtles and their nesting habitat. If you any questions regarding this biological opinion, please do not hesitate to contact Chuck Sultzman of our office at (561) 562-3909.

Sincerely,

Craig Johnson
Supervisor, South Florida Ecosystem Office

cc:
FWS, Jacksonville, FL (Attn: Sandy MacPherson)
FDEP (OPSM), Tallahassee, FL
NMFS, St. Petersburg, FL

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PORT EVERGLADES
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October 9, 1996

A.J. Salem, Chief, Planning Division
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-019

Dear Mr. Salem:

Port Everglades appreciates the opportunity to review and provide comments regarding the Draft Feasibility Report and Draft Environmental Impact Statement (DEIS) for the Coast of Florida Erosion and Storm Effects Study, Region III. The following are staff comments which are encouraged to be incorporated into the Final EIS.

Page 98, paragraph 205 and page 132, paragraph 273 of the Feasibility Report, together with page EIS-13, paragraph 2.4.2.3.2 of the DEIS, state that the only recommended modification to the John U. Lloyd project segment is a nearshore berm site as an alternative maintenance dredged material disposal site. It should be noted that there is an ongoing U.S. EPA study to locate an offshore dredged material disposal site to the east of the Port Everglades Entrance Channel. These reports should be consistent with this ongoing study.

Port Everglades Project, Map 20 of Appendix A, indicates an Army Corps of Engineers maintenance depth responsibility along the Intracoastal Waterway, south of the Turning Basin, 36-feet for a width of 400 feet. However, the current project depth for this area is 42 feet MLW for a width of 500 feet. In addition, the project depth of the outer entrance channel is 47 feet MLW for a width of 500 feet, while the map incorrectly shows a project depth of 45 feet. This map needs to reflect the current project depths for Port Everglades Harbor.

Page B-15, paragraph B-74 of Appendix B sites a study titled "Survey-Review Report on Port Everglades Harbor, Florida". It should be noted that this study is dated August 16, 1957 and includes data and recommended project depths which are no longer current.

Page D-191, paragraph D-383 of Appendix D states "Since 1931, the inlet has been designated as a Federal project, and is currently maintained to an outer depth of 47 feet MLW and a width of 500 feet." It should be noted that the project depth of the inner channel is 42 feet MLW and 450 feet wide, while the outer channel is 47 feet MLW and 500 feet wide.

Tables F-19, F-20, and F-21 of Appendix F describe Storm Damage Model Input data for a Port Everglades Sand Transfer Plant. They note that this project was eliminated during the initial screening of alternatives. It is generally agreed that the Port Everglades Channel Entrance is responsible for extensive and ongoing beach accretion to the north and beach erosion to the south of the entrance jetties, while shoalling naturally occurs both offshore and inside the harbor entrance. This is described in detail on pages D-194 through D-197 of Appendix D. The feasibility of a sand transfer plant alternative should therefore be revisited by the U.S. Army Corps of Engineers in order to restore the natural net littoral drift rates as recommended on Page D-197, paragraph D-398 of Appendix D. In addition, please refer to the Port Everglades Inlet Management Plan, dated March, 1994, prepared by Coastal Technology Corporation for the Broward County Department of Natural Resource Protection regarding this subject.

Page G-11, paragraph 6.b. of Appendix G, states that in Broward County, there are 150.76 Federally held acres of easement interest acquired in support of the Port Everglades Harbor project. If this refers to the portion of the Port Jurisdictional Area bounded by the Turning Notch to the north, the Dania Cutoff Canal to the south, the Intracoastal Waterway to the east, and McIntosh Road to the west, it should be noted that most of this 150 acre area has been developed by Port Everglades as the Southport Container Facility. There is presently an area within Southport totalling approximately 20 acres, which is designated as an on-shore dredge disposal site.

This concludes the comments of the Feasibility Report, DAIS and related Appendices prepared by the staff of Port Everglades. Feel free to direct any questions regarding these comments to Mitchell Harvey, Strategic Planning Manager or Allan Sosnow, Environmental Projects Manager.

Sincerely,

Maurice F. Canady, Jr.

Maurice F. Canady, Jr., PE, Director
Construction Management and Planning Division

MFC:MNH

cc: James J. O'Brien, Port Director
Gene F. Ciccarelli, Deputy Port Director
Bob Flint, Director of Operations
Mitchell N. Harvey, AICP, Strategic Planning Manager
Allan D. Sosnow, Environmental Projects Manager
Steve Sommerville, Director, Broward County Department of Natural Resources

RESPONSE TO COMMENTS FROM MAURICE F. CANADY, JR., PORT EVERGLADES, LETTER DATED OCTOBER 9, 1996.

1. Paragraph 2. The primary focus of the Coast of Florida Erosion and Storm Effects Study is to protect the valuable resources along the coastline. Sand is a very valuable resource, especially in South Florida. As such, a keen study interest is to maintain all available sand within the nearshore environment. A nearshore berm site off of J.U. Lloyd Park has been identified and recommended by this study, for this purpose. If dredged material is suitable for nearshore disposal it is hoped that the material would be placed in this nearshore site. The referenced U.S. EPA study for an offshore site could be used for non-beach quality dredged material through the Operations and Maintenance (O&M) navigation project.

2. Paragraphs 3 and 5. The authorized Port Everglades Federal Navigation project is for the entrance channel to 45 to just inside the jetties. Initial construction of the entrance channel included an additional overdepth of 2 feet, since rock occurs near project depth. The entrance channel is authorized to be maintained to the 45 foot depth. The reference to the 47 foot depth on page D-191, paragraph D-383 includes a 2-foot allowable overdepth; however, the authorized maintained channel depth is 45 feet.

3. Paragraph 6. The feasibility and economic justification of a Sand Transfer Plant was assessed for Port Everglades Inlet during the Coast of Florida Erosion and Storm Effects Study. As identified in this study's sediment budget (Figure D-47, Page D-195), the net longshore sediment transport rate in the vicinity of Port Everglades Inlet is 42,000 cyds per year from the north. Of this amount, 30,000 cyds per year is deposited along the shoreline between monuments R-79 and R-85, to the north of the Inlet. It is estimated that approximately 5,000 cyds per year is lost to the system, to offshore transport, leaving only 7,000 cyds per year available for capture by a Sand Transfer Plant. The Port Everglades Inlet Management Plan basically confirms this sediment budget.

This small amount of material is not sufficient to economically warrant the investment in the development of a Sand Transfer Plant for Port Everglades. In the future, if the physical processes and/or the geomorphic/sediment transport responses change at Port Everglades resulting in increased volumes of available sand, the viability of a Sand Transfer Plant could be reassessed for economic justification.

Sanford F. Kuvin, M.D.
149 East Inlet Drive
Palm Beach, Florida 33480
Telephone: 561-842-3838
Fax: 561-842-6743

Mr. George Strain, P.E.
Acting Chief
Jacksonville Engineering District
US Army Corps of Engineers
P.O. Box 4970
Jacksonville, Fl. 32232-0019

Re: Public Coordination of the Draft Report
Comment on the Coast of Florida Study
Region 3
Feasibility Study
Palm Beach Harbour, Lake Worth Inlet

October 7, 1996

Dear Mr. Strain:

I have reviewed the Draft Report of the Coast of Florida Study as it relates to Region 3 of Palm Beach Harbour and the Lake Worth Inlet.

Please be advised that I object to two proposals in the report which I feel are detrimental to the shoreline of the Town of Palm Beach, and the long term interests of the Army Corps maintenance responsibilities of the navigational channel called the Lake Worth Inlet. In addition to not being cost effective, these proposals, in my opinion, are wasteful of federal and local moneys.

The Report recommends **the building of a new Sand Transfer Plant** at the Lake Worth Inlet with "advanced technologies". The old STP was operational from 1958 until 1990, pumping approximately 70,000 to 100,000 cubic yards of sand each year to the north end feeder beach located at the south jetty spoil area whose sand flows uniformly south with the littoral flow. This form of sand transfer, complimented by periodic ACOE's dredging of the Lake Worth Inlet with deposition of the dredged sand on the north end spoil area south of the south jetty has kept our beaches in a steady stable state for almost 40 years. The Town of Palm Beach sued the county in 1990 as to who would be responsible for STP maintenance, and during the 6 year period while the case was litigated there was no STP operation, 200 feet of north end feeder beach was lost, and without the north end feeder beach nourishment from the STP, the midtown section of the town lost so much sand that a $6,000,000 Midtown Beach Restoration Project was expedited by the town, declaring it an emergency operation. After the 6 year hiatus in STP operation, the town finally agreed, under public pressure, to rehabilitate and significantly upgrade the STP at a cost of $1,000,000. This has now very recently been completed with larger diameter pipes, an increase in 200 horsepower to the power plant and a visible significant increase in outflow of sand. The advantages of jet pump technology as mentioned in the Report, and other forms of "advanced technology", are constantly being debated amongst coastal engineers as to their applicability and advantage, but to change a known technology that works in our region (the upgraded STP) at significant local expense to a questionable technology with unknown outcomes with federal and even more local expense is unwarranted. In fact, the ACOE's Coast of Florida Study was drafted during a period when it was not known to the ACOE when, if ever, the STP would become operational again. In my opinion, because the town has just invested $1,000,000 in a virtually new (except for the concrete housing shell) upgraded STP, pumping more sand then ever in its history, the destruction of the old STP and rebuilding of a new STP would be unsonscionable and a gross waste of local and federal moneys.

Part of the Report calls for a 3000 foot **pipe extension from the STP** extending south on to the shores of Palm Beach from the south jetty with multiple outlet valves. This pipe extension proposal is predicated on the "theory" that there is a northerly flow of sand from 'nodal points' south of the south Lake Worth jetty, coursing around the south jetty and entering into the inlet causing shoaling in the navigational channel. In fact, a *bone fide* study has never been made since 1957 utilizing the necessary engineering components which together would contribute to a new informed recommendation. These component parts include the combination of sand marking, wave refraction, pre and post construction maintenance dredging surveys 3, 6, and 12 months after dredging to follow the course of the sand, and periodic surveys of exactly where the sand emanating from the STP goes. None of this has ever been done. Every coastal engineer and coastal geologist will reaffirm that the littoral flow of sand along our coast is uniformly south, with only minor exceptions. A 'nodal point' of northerly sand flow argued in favor of the pipe line extension from the STP by Applied Technology Management (ATM), the firm hired by the Town of Palm Beach, states (page 27, line 3) "Weak (underlined for emphasis) nodal points exist 1000 feet and 4000 feet from the south jetty." Surely this singular inexact study based on a one time wave refraction study and a one time non factual aerial visual observation, revealing a weak nodal point, is not cause for a multimillion dollar revision to a STP system partly federally funded that has proven to work at keeping the north end feeder beach in a steady stable state for over 40 years. ATM estimates that 27,000 cubic yards of sand flow north around the south jetty into the inlet yearly. They base this observation on a computerized 20 year study of wave data obtained from the ACOE files. If the northerly flow of sand theory had any merit - the 6 year period of no STP operation between 1990 and 1996 would have produced at least some accretion of sand at the south side of the south jetty, when in fact a 200 foot loss of beach occurred. Again, this pipeline extension"advanced technology" is not only new in concept, but has never been tried or engineered, with no cost estimates, no projected outcomes of sand dispersal, and with the strong probability of a legal can of worms.

Expensive experimentation with untested methods with a new STP and a pipeline extension with multiple outlets such as those proposed by the Coast of Florida Study, may well produce irrevocable harm to the beaches of Palm Beach, the properties adjacent to them, and to the navigational channel of the Lake Worth Inlet.

I urge the Army Corps to delete these two proposals from from consideration as they relate to the Coast of Florida Study, Palm Beach Harbour - Lake Worth Inlet project.

Sincerely,

Sanford F. Kuvin

Sanford F. Kuvin, M.D.

cc: Mayor and Town Council
Mr. Robert Doney, Town Manager
Mr. Richard Bonner, ACOE, Jacksonville, Fl.
Mr. Gary Hardesty, ACOE, Washington, D.C.
Mr. G. Edward Dickey, Chief Planning, ACOE, Washington, D.C.
General C. Ballard, Chief, ACOE, Washington, D.C.

RESPONSE TO SANFORD F. KUVIN LETTER DATED OCTOBER 7, 1996

Mr. Kuvin objects to the construction of a new sand transfer plant and extension of the outfall pipe. His statements concerning the stability of Palm Beach Island are not supported. Approximately 8.3 miles of Palm Beach Island are suffering with significant erosion. Palm Beach Island lost 788,500 cubic yards of sand between 1974 and 1990. A small area just south of Lake Worth Inlet, where Mr. Kuvin lives, has been relatively stable due to the placement of sand from the existing sand transfer plant and from maintenance dredged material. Only a small fillet occurs against the south jetty due to its porous nature. Both the extend and nature of the nodal zone has been verified by numerical modeling. We concur that additional field work would add in the design of a new sand transfer system.

The design of a new sand transfer system will require carefull planning. However, jet-pump technology is not new. The fluidizing of sand and its placement through a pipe with several outlets is commonly used in almost every beach nourishment contract. The Corps will require extension of the discharge line approximately 1,800 feet to the south as a prerequisite to Federal participation. Discharge points would be located 750, 1,250 and 1,750 feet south of the south jetty. The need for the extension is discussed in the main text of the report, and is supported by engineering analysis in Appendix D. Numerical modeling (GENESIS) indicates that a stable shoreline can be maintained while avoiding the nearshore reefs to the south of the project area.

The cost of the new system will be lowered substantially by the work already done by the Town of Palm Beach to upgrade the existing plant. In particular, the new discharge lines under the inlet will save an estimated $800,000.

Att. Mr. George Strain
P.O. Box 4970
Jacksonville, FL 32232-0019

Re: Coast of Florida Study

Oct. 7, 1996
232 La Puerta Way
Palm Beach, FL 33480
407-844-5456

Dear Mr. Strain,

I only found out this afternoon that today is the last day that I can object to the USACOE's prospective project of spending some $3.9 million on building a plant to both transfer sand from the north side of the Lake Worth Inlet to the south side and also dredge the inlet.

I object to this project for the following reasons:

1. No details of how this plant would work have been furnished. Dredging the inlet from a fixed plant is a new and untried technology.

2. No yearly operating costs of the proposed plant have been furnished.

3. Who would have to foot the bill for the plant's operating expenses has not been stated.

4. No statement has been made about the Town of Palm Beach's proposal to build an extension to the pipe from the inlet to transport sand from the transfer plant further south, to which I also object.

5. No statement has been made about how long it will take to build the plant, when it could be expected to start operating.

6. No statement has been made about whether the present plant would have to be shut down while the USACOE's plant is being built.

7. No statement has been made about whether the COE plant would transfer sand any more efficiently than the Town's rebuilt plant.

8. No statement has been made about whether the COE plant would cost more to run than the Town's plant.

9. Usually any federal government project costs everybody much more than a non-government project. No cost estimates for any part of this project have been made publicly available.

Sincerely yours, Jim Koontz Jim Koontz

RESPONSE TO LETTER FROM MR. JIM KOONTZ DATED OCTOBER 7, 1996.

The details concerning the construction, operation and maintenance of the recommended sand transfer system will be developed during preconstruction, engineering and design. Due to the complex nature of the facility, these studies could take up to four years (response to 1, 2, 5, 6, 7, and 8). Final cost sharing for the project is under Department of Army review. The Federal Government will participate in t he construction of the plant. Operation and maintenance is a non-Federal responsibility. We are not aware of the Town's proposal to extend the outfall pipe to the south. The Corps will require extension of the discharge line approximately 1,800 feet to the south as a prerequisite to Federal participation. Discharge points would be located 750, 1,250 and 1,750 feet south of the south jetty. The cost estimate and design details for the project are located in Appendix D of the feasibility report.

TOWN OF PALM BEACH

Public Works Department

FAXED 10/4/96

October 4, 1996

VIA FAX & FIRST CLASS MAIL

Mr. A.J. Salem, Chief - Planning Section
Army Corps of Engineers - Jacksonville District
P.O. Box 4970
Jacksonville, FL 32232-0019

Dear Mr. Salem:

We are writing in regard to the Corps' Draft Coast of Florida Study for Palm Beach, Broward and Dade Counties. Because of the massive size of the primary document and its appendixes, we offer a cursory review of the document concentrating on the broader issues and concerns as follows:

1. Sand Transfer Plant - We believe the analyses and benefits of the operation of the plant are badly understated. After the plant ceased operation, it took some time for the sand to stack-up on the north side of the north jetty. However, once the sand stacked on the north side, it began pouring into the inlet, particularly when driven by northeast storm events. The figures contained in Table D-15 on Page D-91 of Appendix D are believed to be inaccurate, particularly years 1994 through 1996 and badly skews the analysis. Attached is a copy of a summary of dredge volumes taken from the Town's Inlet Management Plan prepared by Applied Technology and Management. The information supplied to us by Corps' personnel regarding recent dredging activity includes 178,000 c.y. in 1994, 212,000 c.y. in 1995 and 174,000 c.y. in 1996. The latter figure does not include an estimated 50,000 c.y. that was left in the inlet because the Corps did not have sufficient funds to dredge it all. The 212,000 c.y. figure for 1995 includes turning basin dredging so the amount from the channel is unknown. Many of the figures for previous years in the 1970's and 1980's also do not agree. We respectfully request that all these figures be reverified.

   If our figures for the last three dredging years are accurate, and we believe they are reasonably so, the annual dredging in the very recent past supports a substantially different conclusion than that indicated by the Corps' analysis. The dredging of 178,000 c.y., 212,000 c.y. and 174,000 c.y. (50,000 c.y. left in channel) while the plant was out of operation and after the sand piled up on the north jetty, would indicate that the operation of the plant had a major impact on the amount of sand deposited in the inlet. We ask that you re-examine this analysis. It is also noted that the sand in the inlet had a major economic impact on the Port of Palm Beach because of reduced channel depth and it seemed that every winter, the ability to ship full loads was greatly impacted. In fact, in 1993, the Corps performed "emergency" dredging to remove 40,000 c.y. and place it offshore because shipping was so badly affected.

The Town renovated the old sand transfer plant placing two new 12" pipes under the inlet. We would expect to receive credit for these pipes as part of the overall plant improvement since we are very sure they will be usable.

The Corps has consistently planned on the use of jet pumps in the new plant. We have major reservations regarding the effectiveness of this style of pump in that we have heard of significant operational problems in recent applications. If the Corps is going to commit to maintenance and operation costs, your insistence on this type of pump is most reasonable. However, if a local sponsor will operate the plant, we ask that you allow the final design process to determine the most cost effective way to pump this sand.

2. North End Palm Beach Island - The cost estimate of $9,387,600 for 339,400 cubic yards (including advanced nourishment) would appear high although mitigation of 18 acres of hard bottom is included. Please verify the overall estimate.

3. Palm Beach Island - The description and analysis does not recognize that the Town placed 800,000 c.y. of sand between R-95 and R-100 as well as eleven groins at a total cost of about $6,000,000 in the winter of 1995/1996. This omission is prevalent throughout the report. The NED project summary for this project also indicates that the renourishment volume of 372,000 c.y. can be placed for $1.00/c.y. Is this realistic?

4. South Palm Beach - No comment.

Generally, the construction of an effective sand transfer plant together with sand fill placement and maintenance at the north end of Palm Beach, the middle of Palm Beach and south end of Palm Beach would appear to provide a system that would keep the Town's beaches in reasonably stable condition. From this standpoint, the Study appears to be well thought out and formulated. We congratulate the Corps on the completion of a very comprehensive and difficult undertaking.

The preceding constitutes the staff comments on the subject document and <u>does not</u> represent an official position by the Town via its elected officials. If you desire an official endorsement or comment, please let us know and we will present same to our Mayor and Town Council for their consideration.

Very truly yours,

Albert P. Dusey

Albert P. Dusey
Director of Public Works

APD/ck

c: Robert J. Doney, Town Manager
James M. Bowser, Town Engineer & P.W. File

Table II. 5.1. Summary of USACOE Maintenance Dredge Volumes, 1948 to 1994

Date	Numeric Date	Location	Disposal	Estimated (cy)	Actual (cy)	Shoaling (cy/yr)	Total Cost ($)
Mar. 1994	1994.25				178,000	273,846	
Jun. 1993	1993.60				40,000	23,810	
Nov. 1991	1991.92				87,335	54,928	
May 1990	1990.42	STP Ceases Operation			Sub-Total 305,335	Average 77,892	
Apr. 1990	1990.33		Beach	66,300	75,351	67,278	
Feb.-Mar.1989	1989.21	Ent. Channel	Beach	99,000	105,576	84,771	$920,000
Feb.-Dec. 1987	1987.58	Chan.&Basin	Beach	174,790	135,402	314,888	$594,746
Feb. 1985	1987.15	Ent. Channel	Off&Beach	132,000	130,803	58,856	$944,246
Oct.-Dec. 1984	1984.92	Ent. Channel	Nearshore	101,000	110,799	67,975	$1,002,876
Mar.-Apr. 1983	1983.29	Ent. Channel	Offshore	825,000	176,171	128,592	$440,352
Nov. 1981	1981.92	Ent. Channel	Offshore	21,334	21,334	31,842	
Mar. 1981	1981.25	Ent. Channel	Offshore	29,955	29,955	36,690	$200,000
May 1980	1980.42	Ent. Channel	Offshore	26,769	26,769	62,253	$221,914
Dec. 1979	1979.99	Ent. Channel	Offshore	24,925	24,925	17,190	$78,872
Jun.-Jul. 1978	1978.54	Ent. Channel	Upland	38,000	43,559	14,989	$195,842
Jul.-Aug. 1975	1975.63	Ent. Channel	Upland	81,000	68,090	40,772	$224,711
Nov.-Dec. 1973	1973.96	Ent. Channel	Upland	159,000	145,498	92,087	$202,511
Apr.-May 1972	1972.38	Ent. Channel	Upland	138,000	131,536	65,769	$164,902
Apr.-May 1970	1970.38	Ent. Channel	Nearshore	45,000	61,949	36,227	$123,898
		Channel Deepened			Sub-Total 1,287,719	Average 64,547	
Aug. 1968	1968.67			11,500	11,500	4,752	$20,460
Mar. 1966	1966.25			11,378	11,378	22,756	
Sep. 1965	1965.75			43,601	43,601	117,841	$47,061
Apr.-May 1965	1965.38			25,700	25,700	17,603	$35,694
Nov. 1963	1963.92			31,506	31,506	32,819	$23,503
Nov.-Dec. 1962	1962.96			44,559	44,559	39,433	$81,702
Oct. 1961	1961.83			3,188	3,188	4,554	$5,280
Jan.-Feb. 1961	1961.13			18,851	18,851	15,579	$36,371
Nov.1959	1959.92			10,208	10,208	9,815	$25,548
	1958.88			7,734	7,734	10,595	$17,620
Aug. 1958	1958.67	STP Begins Operation			Sub-Total 206,225	Average 19,793	
Feb. 1958	1958.15			24,351	24,351	55,343	$23,920
Aug.-Sep. 1957	1957.71			28,421	28,421	37,895	$30,279
Nov.-Dec. 1956	1956.96			67,960	67,960	49,246	$27,463
Jul. 1955	1955.58			46,694	46,694	19,216	$12,530
Feb. 1953	1953.15			46,037	46,037	40,032	$24,710
1952	1952.00			57,120	57,120	57,120	$20,622
1951	1951.00			122,928	122,928	122,928	$34,342
1950	1950.00			45,410	45,410		$26,948
1948	1948.00						
Channel Deepened					Sub-Total 438,921	Average 43,243	
					Total 2,240,200	Average 48,437	

RESPONSE TO COMMENTS FROM THE TOWN OF PALM BEACH, LETTER DATED OCTOBER 4, 1996.

The estimated volumes dredged at Lake Worth Inlet in the Town's Inlet Management Plan prepared by Applied Technology Management are inaccurate. The fact that emergency dredging was required while the plant was inoperable is irrelevant. Emergency dredging was required in 1980, 1981 and 1985, all years in which the sand transfer plant was operational. A small shoal moved by storm energy into the channel will adversely affect navigation irrespective of the location, size and operational capabilities of the plant.

We have no authority to recommend reimbursement for the work accomplished by the Town to date for the refurbished sand transfer plant. To be eligible, the project must first be authorized by Congress. The new sand transfer plant a Lake Worth Inlet was authorized by the Water Resources Development Act of 1996, subject to a report of the Chief of Engineers. We anticipate a Chief of Engineers report in December 1996. Next, the design documents to support project construction must be prepared. Then a project cooperation agreement (PCA) must be executed between the Corps and the project sponsor. Assuming that the Town of Palm Beach in the project sponsor, only work performed by the Town after execution of the PCA is eligible for reimbursement.

The new sand transfer plant will be constructed by the Corps. The Corps cannot participate in the operation and maintenance of shore protection projects, since this is prohibited by Federal law. The one exception is periodic nourishment, which is considered construction for cost sharing purposes. After construction, the plant would be operated for a short time by the Corps jointly with the project sponsor to insure that the plant is functioning adequately. Afterward, it will be the responsibility of the non-Federal sponsor to operate and maintain the plant. The details of the plant, including the type of equipment used, will be worked out during the preconstruction, engineering and design phase of the project.

The cost estimate for the north end of Palm Beach Island is appropriate for this phase of the study. The report reflects conditions of the shoreline based on surveys taken in 1990. Actions taken such as those you describe at Mid-Town in 1995 and 1996 could not be incorporated into this document, which was essentially completed by May 1995. It is noted that the comments provided do not reflect the official position of the Town of Palm Beach.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
100 ALABAMA STREET, S.W.
ATLANTA, GEORGIA 30303-3104

OCT 8 - 1996

Mr. A.J. Salem
Chief, Planning Division
Jacksonville District, Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232
Attn: Mr. Michael Dupes, CESAJ-PD-ER

Subject: Draft Environmental Impact Statement (DEIS) for the Coast of Florida - Erosion and Storm Effects Study, Region III, Palm Beach, Broward, and Dade Counties, FL

Dear Mr. Salem:

Under the authority of Section 309 of the Clean Air Act and Section 102(2)(C) of the National Environmental Policy Act (NEPA), EPA, Region 4 has reviewed the subject document; an evaluation of the consequences of an array of projects and alternatives thereof which will attempt to modify natural coastal geomorphic processes on the southeastern coast of Florida. Specifically, these actions deal with the immediate construction of widened beach widths with fill material and/or metered processes such as building nearshore berms which in time should also widen the areal extent of the dry beach.

Sand transfer facilities are proposed for Lake Worth and South Lake Worth Inlets to provide operational efficiencies and militate the sand shadow created by the jetties associated with their navigation channels. There is a terrestrial component to the proposal, viz., efforts will be made to stabilize area dunes through the use of grass plantings.

We were pleased to see a single document used to evaluate the beach nourishment activities being pursued by the Jacksonville District in Region III. The number and scope of these projects will give decision-makers a much better perspective of their magnitude than would be the case were they presented singly. Further, the wide variation in their benefit/cost ratios will give these same officials a better sense of the amplitude of their societal importance. A review of our records indicates that we have commented on most of the these projects in the immediate past; hence, we have only provided general observations in this instance.

Interestingly, some of the beach fill may utilize a Bahamian sand source. Use of this foreign material would not put local resources at risk from dredging activities, but there are also some potential negative ramifications which will require further investigation prior to its wide spread use on the subject reaches. However, given the lack of local material, there is a compelling need to examine any/all sand sources which could be used to widen the subject beaches. This need is serving as a powerful stimulus to complete the necessary studies, especially those regarding long-term consequences to nesting turtles.

It is anticipated that the addition of fill material will reduce damage to shoreline properties from small storm events and expand the recreational potential within the nourished reaches. A management strategy to lessen the inevitable impacts to the nearshore environment, especially inundation of hard bottom habitat, will be implemented. Mitigation of unavoidable adverse impacts will be accomplished after the extent of actual losses is determined by subsequent visual inspection and refinement of the equilibrium profile equation.

Purpose and Need Considerations

As we have repeatedly indicated to the District, EPA is equivocal regarding the issue of pumping sand onto an eroding shoreface. Generally, we have not opposed beach nourishment when it provided a disposal site for a proximate, already authorized navigation project. The key factor, however, was whether or not biologically sensitive resources would be adversely affected through the use of this disposal method. As is usually the case, the value of adjacent structures, declining width of the recreational beach, and the perceived need to provide continued economic potential to shorefront property serve as the rationale for beach nourishment. The dollar value assigned to these factors in the benefits/costs calculations almost always are deemed to subsume any environmental losses.

We are pleased to note that this document acknowledges how erosive marine processes are affecting the entire coastline of Florida. The cumulative costs, both environmental and economic, of providing shoreline protection to all these areas can only be realistically examined in this comprehensive manner. This is especially true as the text indicates that federal interest and more importantly funding available for these type projects is evolving. Our concerns in this regard center not on the overall economics, but rather on how these changes could affect potential mitigation (direct and indirect) monies available to lessen environmental impacts.

Necessary Ongoing Investigations

The noted mitigation measures can lessen to some greater/lesser degree certain issues which have fostered concerns about previous, similar proposals, e.g., direct/immediate loss of seagrass resources. However, we recommend that further coordination continue between involved

Corps technical staff sections to: more fully consider the impacts to the important biological resources present throughout the project area, especially as the deposited sand migrates during equilibrium processes; evaluate adjacent nearshore impacts of mining sand from the remaining borrow site in Palm Beach County; and better define the action's resultant physical and water quality characteristics/impacts after sand placement. Some qualitative discussion should be made regarding the impacts/consequences of mining sand from the Bahamian sites. Notwithstanding its relative proximity to the nourished beaches, some thought should be given to the potential of introducing exotics with this material. Similarity when a precise borrow location is established, the site should actually be examined for the presence of hazardous/toxic materials which may have been dumped there.

Additionally, from a practical standpoint staff should verify that the public will actually be able to access the upgraded beach after it has been constructed. It has been our experience that adequate, appropriately designed parking together with passage to the beach for non-shorefront residents has proven elusive. Since a major component of the purpose/need benefits associated with these action(s) accrue from overall recreational potential, sufficient entry to the beach is important. While we noted that there is total of 218 public access points, the average is every half mile rather every quarter mile which we understand is required.

Proposed Mitigation

Some of the environmental impacts of this proposal have been lessened via the noted management decisions, e.g., scheduling construction activities outside of the peak sea turtle nesting season. However, an undetermined amount of nearshore hardbottom communities will be buried by fill material for a period of time. Moreover, the deposition of dredged material from maintenance actions throughout the region will adversely affect biota in similar impacted nearshore habitats.

The consequences and overall significance of this functional loss of hard bottom habitat on both mobile and sessile species have historically been a matter of discussion among the resource agencies and the Jacksonville District. Because this remains a matter of contention, additional site specific monitoring and analysis should be conducted. These studies would isolate and define the level of mitigation necessary to compensate for the adverse consequences from this and associated actions throughout the project area.

Significant losses of important hard bottom/reef fishery habitat along the nourished beaches are anticipated/probable. These losses are of great interest to EPA. While no details are provided in this generic document, mitigation plans for the "permanent" inundation caused by broadening the beach have previously focused on artificial reef creation to mimic the type habitat lost. The overall, long-term effectiveness of this type of mitigation is cited as a given.

While plausible, we continue to believe that the utility of using artificial reefs as well as the replacement ratios therefor as mitigation needs to be further examined. As was noted in previous Corps of Engineers' documents, investigators routinely observe concentrations of fish around artificial reefs. However, it was also observed that commercial/recreational fishermen frequent these sites. Hence, the value of artificial reefs as attractors for adult fish appears to be demonstrated; moreover, their value in the overall life cycle of these same species is apparent but not precisely determined. If the overall worth of mimic reefs were more precisely ascertained, it could lessen concern about unintended consequences, viz., these devices serve to make selected fish populations more vulnerable by increasing catch per unit of effort.

Until this issue is examined through direct investigation, the replacement ratios for these features should receive more thought. As the matter currently stands, we are concerned that construction of these structures may only provide short-term benefits to fishing interests, but unknown (at least unquantified) positive impacts to the overall ecology of the reef species, especially those being targeted by fishing interests.

Long- and short-term timed averages of exposed hard bottoms are usually used in the mitigation calculations. The premise that after construction not all of the impacted habitat will be continuously covered by sand appears well founded; however, from a functional standpoint, the intermittent nature of its availability may well produce the same result as unbroken inundation.

There seems to be the hypothesis that nearshore populations can intermittently be denied important habitat elements without adverse effect. The significant, but unknown, element of the equation is the length of time involved until critically is reached. Population dynamics can be very difficult to project; however, often times biotic systems deal with the absence of critical elements through the death of a subset of the affected population. Hence, we suggest the notion of using a timed average subset of the affected habitat may have flaws which are significant enough to require a general rethinking of this approach to mitigation planning.

<u>Alternative Mitigation Measures</u>

We continue to suggest that a portion of the total environmental loss component attendant to future site specific projects be addressed by adding out-of-kind mitigation. For example, non-point run off from adjacent developed/hard surface areas could be redirected to some form of treatment within the project reach. A retention/detention type facility with oil/grease separator would lessen the adverse impacts of the current situation in which untreated runoff directly accesses the nearshore habitat. In our opinion, lessening the adverse consequences of this runoff on this sensitive/important environment could be as beneficial as just providing some additional increment of artificial hardbottom habitat in the adjacent nearshore ocean zone. Moreover, water quality improvement would benefit recreational interests. This and other out-of-kind measures could be used for similar nourishment projects which are planned/authorized in the other Regional efforts. Any measures which can lessen the impacts of increasingly pervasive shoreline development need to be examined.

Potential Stabilization Problems

Corps of Engineers' publications often note that the use of groins/training structures to stabilize components of eroding shorelines produce mixed results. Site specific documents should detail the Jacksonville District's experiences and successes with these and other hard structures to control beach erosion. Unfortunately, previous efforts at shoreline stabilization have demonstrated that seemingly well-crafted solutions often translate/exacerbate the erosion problem on adjacent beaches, thereby requiring additional and evermore complex solutions.

EPA has assigned a rating of EC-2 to the proposal. That is, we have some environmental concerns regarding the long-term and/or unanticipated consequences of these actions, per se, and just as importantly how they will all affect one another. The additional information derived from the subsequent mitigation and monitoring plans should be instrumental in resolving these issues. Hopefully, it will also provide some insights into the larger issue of the overall environmental consequences of shoreline protection.

If we can be of further assistance in this matter, Dr. Gerald J. Miller (404-562-9626) will serve as initial point of contact in regard to NEPA matters, whereas Mr. Jose Negron (404-562-9422) should be contacted on Section 404 issues.

Sincerely yours,

Heinz Mueller

Heinz J. Mueller, Chief
Office of Environmental Assessment

RESPONSE TO COMMENTS FROM THE U.S. ENVIRONMENTAL PROTECTION AGENCY, LETTER DATED OCTOBER 8, 1996.

1. Purpose and Need Considerations. "As we have repeatedly indicated to the District, EPA is equivocal regarding the issue of pumping sand onto an eroding shoreface."

Response: Since 1982, your office has opposed Federal participation in beach nourishment, except when it occurs as a part of operation and maintenance of a navigation project. EPA's long-standing position is based in large part on "Saving the American Beach: A Position Paper by Concerned Coastal Geologists", March 1981. EPA has in fact quoted this publication in responding to NEPA documents prepared by the District in 1982 (Dade County), 1984 (Key Biscayne), 1990 (Manatee County) and 1991 (Sarasota County). EPA's general objections, which echo those is this paper, are as follows:

(1) Doubt as to whether the long term commitments inherent in shore protection projects are in the overall public interest;

(2) These projects only produce short-term results at ever increasing costs;

(3) Beach nourishment may foster greater future property losses which would result from inducing additional development;

(4) Beach nourishment generally produces only localized benefits;

(5) Non-structural measures are almost always discounted as not meeting planning objectives;

(6) Pumping sand onto an unstable shoreface only postpones the inevitable shoreline retreat;

(7) Environmental consequences are only considered on a project by project basis. Cumulative environmental impacts of all beach nourishment within the Jacksonville District have not been addressed.

While the national debate about Federal involvement in shore protection continues, many of the programmatic issues raised by EPA concerning beach nourishment have been answered in two recently completed studies on beach restoration and nourishment, one by the Corps and one by the National Research Council.

The U.S. Army Corps of Engineers recently completed a study performed in response to a March 1993 request by the Office of Management and Budget for the Army to analyze the effectiveness of the Federally sponsored shore protection program. The study's purpose was to compare and contrast the estimates of project benefits, costs and environmental effects with current and projected conditions. The study included a comparison of the anticipated and actual level of protection as well as an analysis of any induced development effects. A summary of the Corps study findings are:

(1) The Corps of Engineers shoreline protection program covers a small portion (8%) of the nation's 2,700 miles of coastline.

(2) Federal spending on the shore protection program is less than one percent of the Corps' Civil Works budget annually.

(3) Corps shore protection projects do not induce development in the areas they protect. It appears that Corps activity has little effect on the relocation and/or construction decisions of developers, homeowners, or housing investors.

(4) Beach restoration and nourishment has been accomplished without significant adverse environmental effects, and quite often enhances the beach environment.

(5) There is limited public awareness of the Federal shore protection program, the locations of Federal projects, and the fact that risks are reduced through project construction.

The National Research Council recently completed a study on beach restoration and nourishment. The NRC concludes that beach nourishment is a viable engineering alternative for shore protection. Its application is suitable for some, but not all, locations where erosion is occurring. Several recommendations were made to improve the cost-benefit analysis procedures of the Corps. The NRC also recommended better public involvement and increased monitoring efforts. References to the reports of the Corps and the Marine Board are enclosed.

The 1996 Water Resources Development Act was signed into law by the President on October 12, 1996. Section 227 reaffirms that it is the policy of the Federal Government to "promote shore protection projects and related research that encourage the protection, restoration and enhancement of sandy beaches, including beach restoration and periodic beach nourishment." Preference was given to areas in which there has been a Federal investment of funds and areas with respect to which the need for prevention or mitigation of damage to shores and beaches is attributable to Federal navigation projects.

References:

U.S. Army Corps of Engineers, Shoreline Protection and Beach Erosion Control Study, Final Report: An Analysis of the U.S. Army Corps of Engineers Shore Protection Program, Water Resources Support Center, Institute for Water Resources, IWR Report 96-PS-1, June 1996.

U.S. Army Corps of Engineers, Shoreline Protection and Beach Erosion Control Study: Economic Effects of Induced Development in Corps-Protected Beachfront Communities, Water Resources Support Center, Institute for Water Resources, IWR Report 95-PS-1, February 1995.

National Research Council, Beach Nourishment and Protection, Committee on Beach Nourishment and Protection, Marine Board, Commission on Engineering and Technical Systems, National Academy Press, Washington, D.C., 1995.

2. Necessary Ongoing Investigations, (paragraph 1). "However, we recommend that further coordination continue between involved Corps technical staff sections to: more fully consider the impacts to the important biological resources present..."

Response: At this time only three project segments are being recommended for Federal participation. The recommended project segments are the Lake Worth Inlet sand transfer plant (STP), the South Lake Worth Inlet STP and beach nourishment Dania. The remaining project segments discussed in sections 2.4 through 2.4.3.5 of the DEIS are not recommended for authorization at this time. To ensure that impacts are minimized, additional environmental studies would be conducted and supplemental NEPA documentation would be prepared during planning, engineering and design (PED) phase for each of the recommended project segments authorized. The same would apply to any of the other project segments if they are considered in the future, including the development of new borrow areas and the use of Bahamian sand as a potential source of beach fill.

3. Necessary Ongoing Investigations, (paragraph 2). "It has been our experience that appropriately designed parking together with passage to the beach for non-shorefront residents has proven elusive."

Response: The certificate of public accessibility, signed by the District Engineer, is located on the last page of the main text. Where lack of either parking or access results in part of the project being inaccessible for public use, the Federal participation for that reach of inaccessible project shoreline is zero. The result is the overall lowering of Federal participation from the maximum allowable by law of 65 percent for eligible project costs.

4. Proposed Mitigation (paragraph 2). "...additional site specific monitoring and analysis should be conducted. These studies would isolate and define the level of mitigation necessary to compensate for the adverse consequences..."

Response: Acknowledged. As previously mentioned, only three project segments are recommended at this time. We do not anticipate any significant adverse impacts to hardground resources from the proposed constuction and operation of the two STPs and the nourishment of the beach at Dania. However, as mentioned before, additional analysis would be performed specific to each project segment during PED. This analysis would be the basis for determining the appropriate level and type of mitigation if needed.

5. Proposed Mitigation (paragraph 4). "If the overall worth of mimic reefs were more precisely ascertained, it could lessen concern about unintende consequenses, viz., these devices serve to make selected fist populations more vunerable by increasing catch per unit effort. (Paragraph 5) "Until this issue is examined through direct investigation..." "As the matter currently stands, we are concerned that construction of these structures may only provide short-term benefits to fishing interests, but unknown (at least unquantified) positive impacts to the overall ecology of the reef species, especially those being targeted by fishing interests."

Response: There might be reason for some concern about concentrating fish, if artificial reefs used for mitigation were constructed in large sandy areas devoid of any type of hardbottom structure. However, artificial reefs used for mitigation are constructed to replace lost or otherwise impacted natural hardbottom and in most cases are located near the area impacted and adjacent to existing natural hardbottom. Since the artificial reefs replace lost natural hardbottom, one should not expect that they would attract fish in any higher concentrations than the natural hardbottom replaced.

6. Alternative Mitigation Measures (paragraph 1). " We continue to suggest that a portion of the total environmental loss component attendant to future site specific projects be addressed by adding out-of-kind mitigation. For exzmple, non-point source run off from adjacent developed/ hard surface areas could beb redirected to some treatment within the project reach."

Response: The top priority for any mitigation effort is to replace "like for like" or to implement "in kind" mitigation. This is especially true for nearshore hardbottom habitat. Although EPA's suggestion of addressing water quality of non-point sources in the project area is desirable, we do not consider this "out of kind" mitigation appropriate for mitigating impacts to hardbottom habitat.

STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS
EMERGENCY MANAGEMENT • HOUSING AND COMMUNITY DEVELOPMENT • RESOURCE PLANNING AND MANAGEMENT

LAWTON CHILES
Governor

JAMES F. MURLEY
Secretary

October 11, 1996

Mr. A. J. Salem
Department of the Army
Jacksonville District Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

RE: Beach Erosion Control Projects - Draft Feasibility Report and Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III - Palm Beach, Broward and Dade Counties, Florida
SAI: FL9608020623C

Dear Mr. Salem:

The Florida State Clearinghouse, pursuant to Presidential Executive Order 12372, Gubernatorial Executive Order 95-359, the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended, and the National Environmental Policy Act, 42 U.S.C. §§ 4321, 4331-4335, 4341-4347, as amended, has coordinated a review of the above-referenced project.

The Department of Environmental Protection (DEP) indicates that the DEP's Bureau of Beaches and Coastal Systems and Division of Marine Resources (DMR) require continued coordination with the Corps of Engineers (Corps) during future project planning, design and permitting phases. The DMR has provided recommendations, as enclosed and summarized below, for consideration prior to completion of the final Environmental Impact Statement (EIS) and individual project designs. The DEP suggests that separate Supplemental Environmental Impact Statements be prepared to accompany the General Design Memorandum for each of the projects contained in the draft EIS and to include:

- Detailed information regarding potential impacts to hardbottom communities, seagrass beds, marine turtle habitat, and fisheries resources;

- The extent and location of proposed mitigation for impacts to hardbottom communities;

- Identification of the specific borrow areas and results of related geotechnical investigations; and

- Measures for avoiding and minimizing impacts to significant marine resources within the project area.

Please refer to the enclosed DEP comments for further details.

The Treasure Coast Regional Planning Council, the South Florida Regional Planning Council, the City of Boca Raton, and the City of Delray Beach have provided comments and recommendations for consideration during future phases of project planning and design. In addition, the City of Delray Beach indicates that the design reduction for the Delray Beach Renourishment project as proposed in the draft EIS is inconsistent with its comprehensive plan. The Corps is encouraged to coordinate the individual projects closely with the affected jurisdictions and to continue to work with the City of Delray Beach in order to resolve the comprehensive plan conflict. Please refer to the enclosed comments.

The Department of State (DOS) notes that the Corps will coordinate project activities with the DOS on a case-by-case basis. Conditioned upon the Corps' coordination with the DOS, the above project will have no adverse impact on any identified significant archaeological or historic sites. Please refer to the enclosed DOS comments.

Based on the information contained in the draft feasibility report, draft EIS and the enclosed comments provided by our reviewing agencies, the state has determined that, at this stage, the above-referenced project is consistent with the Florida Coastal Management Program (FCMP). All subsequent environmental documents prepared for this project must be reviewed to determine the project's continued consistency with the FCMP. The state's continued concurrence with the project will be based, in part, on the adequate resolution of issues identified during this and subsequent reviews.

If you have any questions regarding this letter, please contact Ms. Keri Akers, Clearinghouse Coordinator, at (904) 922-5438.

Sincerely,

James F. Murley
Secretary

JFM/rk

Enclosures

cc: Jim Wood, Department of Environmental Protection
Michael J. Busha, Treasure Coast Regional Planning Council
Eric Silva, South Florida Regional Planning Council
Ronald G. Laccheo, City of Boca Raton
John Walker, City of Delray Beach
George W. Percy, Department of State

Department of Environmental Protection

Lawton Chiles
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Virginia B. Wetherell
Secretary

September 27, 1996

Keri Akers
State Clearinghouse
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100

RE: COE/Draft Feasibility Report and Draft Environmental Impact Statement (EIS), Coast of Florida Erosion and Storm Effects Study
SAI: FL9608020623C

Dear Ms. Akers:

The Department of Environmental Protection supports the completion of this study and will continue to participate in its development. The Department's Bureau of Beaches and Coastal Systems (BBCS) is assisting the Army Corps of Engineers in completing the evaluation of erosion along Florida's coast. The BBCS has no further comments to offer at this time. Based on the review of this draft report and EIS, the Department's Division of Marine Resources (DMR) provided the following comments and recommendations. These comments should be addressed in the final document and considered as individual projects are planned and designed in the future.

DMR finds that the feasibility report contains a comprehensive evaluation of beach management strategies for Region III. As noted in the draft EIS, many environmental issues remain unresolved. DMR recommends that a Supplemental Environmental Impact Statement accompany the detailed General Design Memoranda that will be prepared for each project contained within the feasibility report and scheduled for implementation. It is also recommended that staff of DMR and other State of Florida resource agencies be consulted for input into the final EIS and subsequent documents.

The selected plan includes multiple shore protection and inlet management strategies for Dade, Broward, and Palm Beach Counties. Recommended actions include beach restoration with subsequent nourishment, creation of nearshore berms, and inlet sand transfer strategies. The document assesses, in general terms, potential impacts to hardbottom communities, seagrass beds, marine turtle habitat and fisheries resources, but detailed biological resource information is lacking on a project-by-project basis. For example, seagrass maps used in the study were prepared from data collected many years ago, at different scales and without the benefit of sufficient field verification. The study recommends mitigation for unavoidable impacts to hardbottoms. No details are given as to the extent or location of such mitigation. Additionally, regional sources of borrow material are identified, although specific borrow areas and detailed geotechnical investigations are not provided.

As noted above and in references to the need for additional "tiered" documentation of measurable impacts, the document lacks the specific detail for a project-by-project analysis. The following issues will be of particular importance to DMR as it reviews proposed projects:

1. Use of Bahamian sand, and its potential beach performance and impacts to marine turtle nesting and incubation;

2. Impacts to sea turtles based upon specific timing of individual projects, sediment compatibility, and appropriate mitigation of compaction, escarpments and habitat degradation associated with construction activity;

3. Direct and indirect impacts on seagrass beds specifically located within south Dade County and within the vicinity of inlets;

4. Direct and indirect impacts on hardbottom communities located within the vicinity of borrow areas, access corridors, and fill areas;

5. Direct and indirect impacts to important recreational fisheries, such as snook, associated with inlet and adjacent beach habitats; and,

6. Feasibility of mitigating loss of seagrass and hardbottom communities.

DMR recommends that final project designs avoid impacts to significant resources expected within the project area (e.g., hardbottoms, sea grasses, marine turtle nesting habitat, etc.) and minimize potential impacts to others. DMR staff should be consulted during the preparation of project-specific documentation to ensure that the best information is available and state resource management policies are considered.

While the level of detail provided in the feasibility report and draft EIS does not allow for complete analysis of impacts, subsequent tiered documentation provided by the U. S. Army Corps of Engineers will provide the opportunity to address these issues thoroughly. The information included in the feasibility report provides the groundwork for the preparation of the final design memoranda and associated documents. Subsequent State Clearinghouse coordination of the design memoranda and supplemental EISs for each project will allow for final consistency reviews by state agencies based on more site-specific data and information.

The Department appreciates the opportunity to review this draft study and EIS. If I may be of further assistance, please contact me at (904) 487-2231.

Sincerely,

Jim Wood

Jim Wood
Environmental Specialist
Office of Intergovernmental Programs

/jw
cc: Fritz Wettstein, Division of Marine Resources
Mark Leadon, Bureau of Beaches and Coastal Systems

FLORIDA DEPARTMENT OF STATE
Sandra B. Mortham
Secretary of State
DIVISION OF HISTORICAL RESOURCES
R.A. Gray Building
500 South Bronough Street
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Director's Office
(904) 488-1480

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(904) 488-3353

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State of Florida Clearinghouse

August 27, 1996

Ms. Keri Akers
State Clearinghouse
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100

In Reply Refer To:
Frank J. Keel
Historic Preservation Planner
(904) 487-2333
Project File No. 963133

RE: Cultural Resource Assessment Request
SAI# FL9608020623C
Coast of Florida Erosion and Storm Effects Study, Region III, with Draft Environmental Impact Statement
Palm Beach, Broward and Dade Counties, Florida

Dear Ms. Akers:

In accordance with the provisions of Florida's Coastal Zone Management Act and Chapter 267, *Florida Statutes*, as well as the procedures contained in 36 C.F.R., Part 800 ("Protection of Historic Properties"), we have reviewed the referenced project(s) for possible impact to historic properties listed, or eligible for listing, in the *National Register of Historic Places*, or otherwise of historical or architectural value.

Upon review of the referenced document, it is our opinion that the historic preservation concerns of this office have been adequately addressed. We note that Corps of Engineers will coordinate project activities with this agency on case-by-case basis. Therefore, conditioned upon this coordination, the project will have no effect to the historic properties listed on eligible for listing in the *National Register of Historic Places*, or otherwise of historic or archaeological value.

If you have any questions concerning our comments, please do not hesitate to contact us. Your interest in protecting Florida's historic properties is appreciated.

Sincerely,

for Laura A. Kammerer

George W. Percy, Director
Division of Historical Resources
and
State Historic Preservation Officer

GWP/Kfk
xc: Jasmin Raffington, FCMP-DCA

COUNTY: State

Message: JW 8/24/96

DATE: 08/05/96
COMMENTS DUE-2 WKS: 08/19/96
CLEARANCE DUE DATE: 09/16/96
SAI#: FL9608020623C

STATE AGENCIES	WATER MANAGEMENT DISTRICTS	OPB POLICY UNITS
Community Affairs Environmental Protection X Game and Fresh Water Fish Comm Health and Rehabilitative Services State Transportation	South Florida WMD RECEIVED BY GFC AUG 2 6 1996 OFFICE OF ENVIRONMENTAL SERVICES RECEIVED SEP 0 5 1996 State of Florida Clearinghouse	Environmental Policy/C & ED RECEIVED BY GFC AUG 1 9 1996 OFFICE OF ENVIRONMENTAL SERVICES

The attached document requires a Coastal Zone Management Act/Florida Coastal Management Program consistency evalutation and is categorized as one of the following:

___ Federal Assistance to State or Local Government (15 CFR 930, Subpart F). Agencies are required to evaluate the consistency of the activity.

_X_ Direct Federal Activity (15 CFR 930, Subpart C). Federal Agencies are required to furnish a consistency determination for the State's concurrence or objection.

___ Outer Continental Shelf Exploration, Development or Production Activities (15 CFR 930, Subpart E). Operators are required to provide a consistency certification for state concurrence/objection.

___ Federal Licensing or Permitting Activity (15 CFR 930, Subpart D). Such projects will only be evaluated for consistency when there is not an analogous state license or permit.

Project Description:

Department of the Army - Draft Feasibility Report - Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III - Palm Beach, Broward and Dade Counties, Florida.

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To: Florida State Clearinghouse
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, FL 32399-2100
(904) 922-5438 (SC 292-5438)
(904) 487-2899 (FAX)

EO. 12372/NEPA

- [x] No Comment
- [ ] Comments Attached
- [ ] Not Applicable

Federal Consistency

- [x] No Comment/Consistent
- [ ] Consistent/Comments Attached
- [ ] Inconsistent/Comments Attached
- [ ] Not Applicable

From:
Division/Bureau: ~~FGFWFC~~ F.G.F.W.F.C.
Reviewer: J. Wroblik
Date: 8/21/96

COUNTY: State

DATE:	08/05/96
COMMENTS DUE-2 WKS:	08/19/96
CLEARANCE DUE DATE:	09/16/96
SAI#:	FL9608020623C

Message:

STATE AGENCIES	WATER MANAGEMENT DISTRICTS	OPB POLICY UNITS
Community Affairs Environmental Protection Game and Fresh Water Fish Comm X Health and Rehabilitative Services State Transportation	South Florida WMD	Environmental Policy/C & ED

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Project Description:

Department of the Army - Draft Feasibility Report - Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III - Palm Beach, Broward and Dade Counties, Florida.

To: Florida State Clearinghouse
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, FL 32399-2100
(904) 922-5438 (SC 292-5438)
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EO. 12372/NEPA

- ☐ No Comment
- ☐ Comments Attached
- ☐ Not Applicable

Federal Consistency

- ☒ No Comment/Consistent
- ☐ Consistent/Comments Attached
- ☐ Inconsistent/Comments Attached
- ☐ Not Applicable

From:
Division/Bureau: HSES
Reviewer: [signature]
Date: 8-19-96

COUNTY: State

DATE:	08/05/96
COMMENTS DUE-2 WKS:	08/19/96
CLEARANCE DUE DATE:	09/16/96
SAI#:	FL9608020623C

Message:

STATE AGENCIES	WATER MANAGEMENT DISTRICTS	OPB POLICY UNITS
Community Affairs Environmental Protection Game and Fresh Water Fish Comm Health and Rehabilitative Services State X Transportation	South Florida WMD	Environmental Policy/C & ED

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State of Florida Clearinghouse

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AUG 7 1996
CENTRAL OFFICE FDOT
ICAR COORDINATOR

The attached document requires a Coastal Zone Management Act/Florida Coastal Management Program consistency evalutation and is categorized as one of the following:

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___ Federal Licensing or Permitting Activity (15 CFR 930, Subpart D). Such projects will only be evaluated for consistency when there is not an analogous state license or permit.

Project Description:

Department of the Army - Draft Feasibility Report - Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III - Palm Beach, Broward and Dade Counties, Florida.

To: **Florida State Clearinghouse**
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, FL 32399-2100
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(904) 487-2899 (FAX)

EO. 12372/NEPA

- [x] No Comment
- [ ] Comments Attached
- [ ] Not Applicable

Federal Consistency

- [ ] No Comment/Consistent
- [ ] Consistent/Comments Attached
- [ ] Inconsistent/Comments Attached
- [ ] Not Applicable

From:
Division/Bureau: Dept of Transportation, Environmental Management Office
Reviewer: Patty Wagner
Date: 8/9/96

COUNTY: State

Message:

DATE:	08/05/96
COMMENTS DUE-2 WKS:	08/19/96
CLEARANCE DUE DATE:	09/16/96
SAI#:	FL9608020623C

STATE AGENCIES	WATER MANAGEMENT DISTRICTS	OPB POLICY UNITS
Community Affairs Environmental Protection Game and Fresh Water Fish Comm Health and Rehabilitative Services State Transportation	X South Florida WMD	Environmental Policy/C & ED

The attached document requires a Coastal Zone M[illegible]

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__ Federal Licensing or Permitting Activity (15 CFR 930, Subpart D). Such projects will only be evaluated for consistency when there is not an analogous state license or permit.

Department of the Army - Draft Feasibility Report - Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III - Palm Beach, Broward and Dade Counties, Florida.

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2555 Shumard Oak Boulevard
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- [X] No Comment
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- [ ] Not Applicable

Federal Consistency

- [X] No Comment/Consistent
- [ ] Consistent/Comments Attached
- [ ] Inconsistent/Comments Attached
- [ ] Not Applicable

UNDER THE OPERATING AGREEMENT BETWEEN THE DEP AND THE WMD'S, THE DEP WILL BE TAKING THE LEAD IN THE PERMITTING OF THESE PROJECTS

From:
Division/Bureau: REGULATION DEPT.
Reviewer: JIM GOLDEN
Date: 8/30/96

FLORIDA STATE CLEARINGHOUSE
RPC INTERGOVERNMENTAL COORDINATION AND RESPONSE SHEET

SAI #: FL9608020623C **DATE: 08/05/96**

COMMENTS DUE TO CLEARINGHOUSE: 09/04/96

AREA OF PROPOSED ACTIVITY: COUNTY: State

☐ FEDERAL ASSISTANCE ☒ DIRECT FEDERAL ACTIVITY ☐ FEDERAL LICENSE OR PERMIT ☐ OCS

PROJECT DESCRIPTION

Department of the Army - Draft Feasibility Report - Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III - Palm Beach, Broward and Dade Counties, Florida.

ROUTING: **RPC**

South FL RPC
X Treasure Coast RPC

RECEIVED
SEP 12 1996
State of Florida Clearinghous-

PLEASE CHECK ALL THE LOCAL GOVERNMENTS BELOW FROM WHICH COMMENTS HAVE BEEN RECEIVED; ALL COMMENTS RECEIVED SHOULD BE INCLUDED IN THE RPC'S CLEARINGHOUSE RESPONSE PACKAGE. IF NO COMMENTS WERE RECEIVED, PLEASE CHECK "NO COMMENT" BOX AND RETURN TO CLEARINGHOUSE.

COMMENTS DUE TO RPC: **08/26/96**

NO COMMENTS: ____

(IF THE RPC DOES NOT RECEIVE COMMENTS BY THE DEADLINE DATE, THE RPC SHOULD CONTACT THE LOCAL GOVERNMENT TO DETERMINE THE STATUS OF THE PROJECT REVIEW PRIOR TO FORWARDING THE RESPONSE PACKAGE TO THE CLEARINGHOUSE.)

NOTES:

ALL CONCERNS OR COMMENTS REGARDING THE ATTACHED PROJECT (INCLUDING ANY RPC COMMENTS) SHOULD BE SENT IN WRITING BY THE DUE DATE TO THE CLEARINGHOUSE. PLEASE ATTACH THIS RESPONSE FORM AND REFER TO THE SAI # IN ALL CORESPONDENCE.

IF YOU HAVE ANY QUESTIONS REGARDING THE ATTACHED PROJECT, PLEASE CONTACT THE STATE CLEARINGHOUSE AT (904) 922-5438 OR SUNCOM 272-5438.

indian river
st. lucie
martin
palm beach
treasure coast regional planning council

RECEIVED
SEP 12 1996
State of Florida Clearinghouse

September 4, 1996

Ms. Keri Akers
Clearinghouse Coordinator
Florida State Clearinghouse
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, FL 32399-2100

Subject: Intergovernmental Coordination Review (ICR) Responses

Dear Ms. Akers:

Please find enclosed staff's comments on **SAI #: FL9608020623C**, relating to the Department of Army Draft Feasibility Report - Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III - Palm Beach, Broward and Dade Counties. Comments are contingent upon Council's review at the regular Council meeting on September 20, 1996. Additional comments from local governments are also attached.

Sincerely,

Michael J. Busha, AICP
Executive Director

Attachments

3228 s.w. martin downs blvd.
suite 205 · p.o. box 1529
palm city, florida 34990
phone (407) 221-4060
sc 269-4060 fax (407) 221-4067

TREASURE COAST REGIONAL PLANNING COUNCIL
INTERGOVERNMENTAL COORDINATION AND REVIEW LOG

TCRPC NUMBER:	96-PB-08-08
APPLICANT:	Department of the Army Corps of Engineers
PROJECT DESCRIPTION:	Draft Feasibility Report - Draft Environmental Impact State for the Coast of Florida Erosion and Storm Effects study, Region III: Palm Beach, Broward and Dade Counties

Introduction

This report summarizes a cooperative cost shared Feasibility Study on the beach erosion and storm damage problems of the lower southeast coast of Florida shoreline which includes Palm Beach County.

Analysis

Florida's shorelines are being investigated on a regional, instead of the conventional project by project basis. The study is based on new computer technology that has resulted over the last decade. Florida is divided into five coastal regions based on distinct differences between the areas, such as wave climate, coastal processes, and beach characteristics. Region III includes Dade County from the southern end of Key Biscayne northward to Jupiter Inlet in Northern Palm Beach County. This region has been identified as the first region to study since it is the most densely populated coastal region in Florida.

The study summarizes the preconstruction studies conducted in Region III relative to beach erosion control and storm damage prevention. Based on these studies storm damage may impact 21.8 miles of Atlantic shoreline in Palm Beach County. The amount of shorefront development threatened by storm in Palm Beach County is estimated to be $2,150,022,525. A rise in sea level could raise the cost estimates due to increase in shoreline recession and storm damages. Palm Beach County is a non-federal sponsor and supports the construction of the projects in Palm Beach County.

Due to the current Administration's commitment to reduce the Federal budget, no new construction starts for shore protection projects or studies are budgeted except as indicated below. Projects will be left to local and state governments to address. The report indicates that the Army Corps of Engineers (ACOE), are phasing out their role in shore protection and beach erosion control.

In accordance with the study and discussion with the Army Corps Of Engineers the status of the projects in Palm Beach County are as follows:

1) **Lake Worth Inlet** is for the construction of a new fixed sand transfer for shore damage mitigation; length: 0.76 miles. The study supports the recommendation that the ACOE should participate in the project **(new project)**.

2) **South Lake Worth Inlet** is for the construction, operation and maintenance of a new Sand Transfer Plant, length: .57 miles. The study supports the recommendation that the ACOE should participate in the project **(new project)**.

3) **Jupiter/Carlin Park** is an authorized beach renourishment project, length: 1.1 miles. The ACOE will continue its support until the contract expires in 2005 **(existing)**.

4) **Juno/Ocean Cay** is an authorized beach renourishment project; length: 2.75 miles It is not constructed and is not recommended for ACOE participation **(new project)**.

5) **North-end Palm Beach Island** is an authorized beach nourishment project, length: 1.95 miles. It is not constructed and is not recommended for ACOE participation **(new project)**.

6) **Palm Beach Island** is an authorized beach nourishment project, length: 3.1 miles. It is not constructed and is not recommended for ACOE participation **(new project)**.

7) **South-end Palm Beach Island** is an authorized beach nourishment project, length 3.25 miles. It is not constructed and is not recommended for ACOE participation. **(new project)**.

8) **Ocean Ridge** is an authorized beach restoration and periodic nourishment project. It is scheduled for construction by Palm Beach County during 1996; length: 1.46 miles **(existing)**.

9) **Delray Beach** is an authorized renourishment project; length 2.65 miles. It has a 50 year commitment which started in 1973 and lasts until 2023 **(existing)**.

10) **Highland Beach** is a modification to the authorized 1962 periodic nourishment project; length: 3.2 miles. It is not constructed and is not recommended for ACOE participation **(new project)**.

11) **Boca Raton** is an authorized beach restoration and periodic nourishment project; length: 1.45 miles. It is limited to 10 year federal participation which expires in 1998 **(existing)**.

Draft Environmental Impact Statement

Based on The Draft Environmental Impact Statement the permanent sand transfer plants proposed for Lake Worth and South Lake Worth inlets are among the combined alternatives needed for overall beach restoration. The report indicates that most impacts from the alternative measures would be short-term and that sea turtle nesting would benefit from nourishment activities. The draft also suggests that no-action alternative would allow beach erosion to continue, further decreasing available nesting habitat and recreational beach acreage in Region III. Storm damages in excess of $33 million would be realized over that which would be expected under the proposed combination of alternatives.

Conclusion

To comply with the Administrative directive: 1) Lake Worth Sand Transfer Plant; and 2) South Lake Worth Sand Transfer Plant including Palm Beach Harbor sand transfer system at Lake Worth Inlet are the new projects recommended for Palm Beach County (see maps). These projects provide a cost savings to the Federal Government in reducing required renourishment volumes for the lives of previously authorized projects; or mitigate for the adverse effects of the navigation project on the downdrift shoreline.

FUNDING AGENCY:	No funding is requested
PROJECT COST:	No funding is requested
RECOMMENDATION:	The study is **consistent with Council's SRPP Regional Goal 6.4, Policies 6.4.1.5 and 6.4.1.6 and 6.4.1.7** which support restoration measures compatible with approved structures; utilize native vegetation for dune restoration, and implement long-term beach stability methods to maintain inlets with coordination and assistance of state, federal and local governments.
AGENCIES CONTACTED:	Palm Beach County Administrator Jupiter Administrator Juno Administrator Lake Worth Administrator Palm Beach Administrator Ocean Ridge Administrator Delray Beach Administrator Highland beach Administrator Boca Raton Administrator

CITY OF DELRAY BEACH

DELRAY BEACH
All-America City
1993

August 22, 1996

AUG 2 6 1996
TREASURE COAST REGIONAL PLANNING COUNCIL

Ms. Bonnie B. Dearborn, Intergovernmental Coordinator
Treasure Coast Regional Planning Council
3228 S.W. Martin Downs Boulevard, Suite 205
P.O. Box 1529
Palm City, Florida 34990

Re: **96-PB-08-08 - Department of the Army - Draft Feasibility Report**

Dear Ms. Dearborn:

This is in response to your request for comments on the Coast of Florida Erosion and Storm Effects Study, Region III - Feasibility Report. Only a portion of the report, through the section entitled "Formulation of Alternative Plans", was received, so our comments are limited to that portion.

In broad outline, the report appears consistent with the City's Comprehensive Plan direction to continue programs for coastal protection. However, it is inconsistent with Coastal Management Element Objective A-1, which calls for continuation of the City's established and ongoing programs for beach erosion control and dune protection.

The inconsistency lies in the proposed reduction in the Federal participation in the project through a re-analysis of the design parameters. The report proposes a new NED Project Summary indicating a design with a 20 foot wide berm at +9.0 feet NGVD, seven year renourishment interval, and renourishment volume of 155,300 cubic yards. (Note: there is a internal inconsistency in the report related to the design description - Item 160 on Page 69 indicates that the renourishment interval is ten years.) The General Design Memorandum for the project defines a design section with a 100 foot berm at +9.0 NGVD, nine year renourishment interval, and renourishment volume of 1,021,000 cubic yards. This design is referenced in the Local Cooperation Agreement (LCA) for the project, which is the vehicle through which the Federal Government participates in the project.

The City will further investigate the inconsistencies in the draft report directly with the Corps of Engineers. To help in this investigation, we request a complete copy of the draft report. At this time, our limited comments regarding the Delray Beach project can be summarized as follows:

- Re-analysis of the project design, and the resulting reduction in the design section, is inconsistent with the City's Comprehensive Plan, the approved project design, and existing agreements with the Federal Government.

- The proposed project design would reduce storm protection of upland public and private properties and infrastructure.

- The proposed project design would reduce protection, and threaten the existence of, sea turtle nesting habitat and the beach/dune ecosystem.

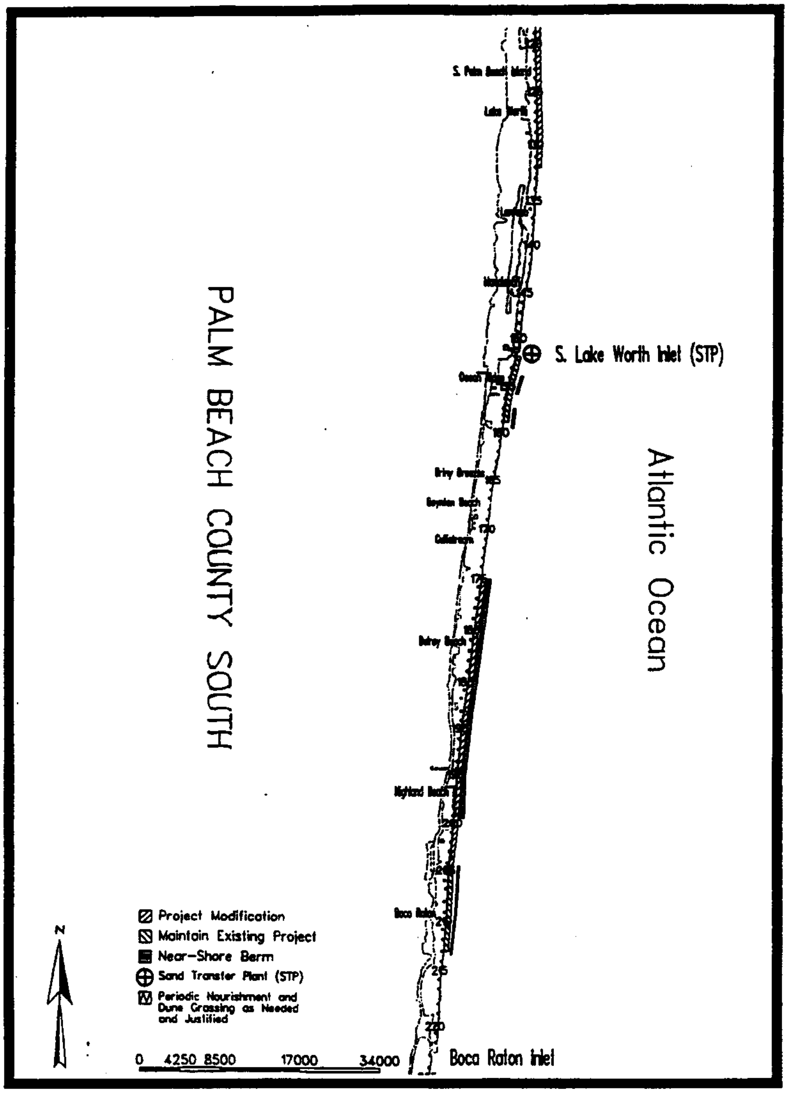
- The proposed reduction in Federal participation would threaten the economic viability of the beach erosion control project.

Thank you for the opportunity to comment on this item early in the process. Such early warning will allow us to appropriately react in a timely manner. Should you have any questions, please call me at (561) 243-7321.

Sincerely,

John Walker
Project Coordinator

Palm Beach Count Project Alternatives, South



TC-96-PB-08-08

City of Boca Raton

CITY HALL • 201 WEST PALMETTO PARK ROAD • BOCA RATON, FLORIDA 33432-3795 • PHONE: (407) 393-7700
SUNCOM: (407) 922-7700

August 26, 1996

Ms. Bonnie B. Dearborn
Intergovernmental Coordinator
Treasure Coast Regional Planning Council
3228 S.W. Martin Downs Boulevard
Suite 205
P.O. Box 1529
Palm City, FL 34990

RECEIVED
AUG 2 ? 1996
TREASURE COAST REGIONAL PLANNING COUNCIL

Re: 96-PB-088-Department of the Army - Draft Feasibility Report
Boca Raton Shore Protection Project

Dear Ms. Dearborn:

Thank you for the opportunity to review the Boca Raton segment of the "Coast of Florida, Erosion and Storm Effects Study - Region III".

We offer the following comments related to the information presented for the Boca Raton project:

1. <u>NED Project Summary:</u> The majority of the NED project summary sheet is blank. With regards to the available information, the project length is not 1.65 miles, but is approximately 1.50 miles. The berm width extension (design berm width) of the constructed project is 50 feet, not 0 feet.

2. <u>Page 69, Paragraph 162, Boca Raton:</u> The berm width listed in this paragraph is 20 feet. The General Design Memorandum (GDM) for the project, which has been updated by the City and is presently under U.S. Army Corps of Engineers review, provides a 50 feet wide design berm. The 50 feet design berm width is also contained in the Local Cooperative Agreement (LCA) for the project. The initial design fill was 406,000 cubic yards with an advanced nourishment volume for an 8 year renourishment interval of approximately 564,000 cubic yards of material. The proposed first renourishment of the project is planned for 1997 with an approximate 600,000 cubic yard fill placement, most of which will be advanced nourishment material.

Under authority of the authorizing design document for Palm Beach County and, more recently, by virtue of Section 206 of the 1992 Water Resources Development Act, the City provides the engineering and construction supervision for the project and receives federal funding on a reimbursable basis. As a result, we can provide the appropriate information related to the design details for our project for the Coast of Florida - Erosion and Storm Effects Study. If this is not possible, we request the opportunity to review and comment on the information for the Boca Raton project when it is available, prior to the finalization of this report.

Thank you for providing the Study for our review and comments. Please advise us if we can supply the appropriate information for our project, or review the missing information when it becomes available in the draft document.

Sincerely,

Ronald G. Laccheo
Municipal Services Director

c: D. Dreska
R. DiChristopher
R. Spadoni

South
Florida
Regional
Planning
Council

August 27, 1996

Mr. A.J. Salem
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

RE: SFRPC #96-0801, SAI# FL9608020623C, Review of the Draft Feasibility Report and Environmental Impact Statement (DEIS) for the Coast of Florida Erosion and Storm Effects Study, Region III (Palm Beach, Broward and Dade County), U.S. Army Corps of Engineers.

Dear Mr. Salem:

We have reviewed the above-referenced feasibility report/EIS and have the following comments:

- The project methodology and design, as proposed is generally consistent with the goals and policies of the *Strategic Regional Policy Plan for South Florida* (SRPP). Council staff supports the implementation of beach renourishment projects for the purposes of providing storm protection for upland property, restoring dunes and maintaining eroding beaches.

- The beaches and dune systems are of regional significance in the *SRPP*. Staff supports the use of buffer zones to protect these important resources. Sand movement and downdrift erosion should be monitored on a region wide basis to ensure the livelihood of wildlife habitats and the stability of renourished areas. All actions should be consistent with the goals and policies of the appropriate county comprehensive plans.

- Staff recommends that, if the proposed actions are implemented, 1) impacts to the natural systems be minimized to the greatest extent feasible and 2) the permit grantor determine the extent of sensitive marine life and vegetative communities in the vicinity of each project and require protection and or mitigation of disturbed habitat. These guidelines will assist in reducing the cumulative impacts to native plants and animals, wetlands and deep water habitat and fisheries that the goals and policies of the *Strategic Regional Policy Plan for South Florida* seek to protect.

- The goals and policies of the *Strategic Regional Policy Plan for South Florida*, in particular those indicated below, should be observed when making decisions regarding this project.

Strategic Regional Goal

3.1 Eliminate the inappropriate uses of land by improving the land use designations and utilize land acquisition where necessary so that the quality and connectedness of Natural Resources of Regional Significance and suitable high quality natural areas is improved.

Regional Policies

3.1.1 Natural Resources of Regional Significance and other suitable natural resources shall be preserved and protected. Mitigation for unavoidable impacts will be provided either on-site or in identified regional habitat mitigation areas with the goal of providing the highest level of resource value and function for the regional system. Endangered faunal species habitat and populations documented on-site shall be preserved on-site. Threatened faunal species and populations and species of special concern documented on-site, as well as critically imperiled, imperiled and rare plants shall be preserved on-site unless it is demonstrated that off-site mitigation will not adversely impact the viability or number of individuals of the species.

3.1.2 Direct inappropriate uses of land that are not consistent with the protection and maintenance of natural resource values away from Natural Resources of Regional Significance and suitable natural resource areas.

3.1.9 Degradation or destruction of Natural Resources of Regional Significance, including listed species and their habitats will occur as a result of a proposed project only if :

a) the activity is necessary to prevent or eliminate a public hazard, and
b) the activity is in the public interest and no other alternative exists, and
c) the activity does not destroy significant natural habitat, or identified natural resource values, and
d) the activity does not destroy habitat for threatened or endangered species, and
e) the activity does not negatively impact listed species that have been documented to use or rely upon the site.

3.1.10 Proposed projects shall include buffer zones between development and existing Natural Resources of Regional Significance and other suitable natural resources. The buffer zones shall provide natural habitat values and functions that compliment Natural Resources of Regional Significance values so that the natural system values of the site are not negatively impacted by adjacent uses. The buffer zones shall be a minimum of 25 feet in width. Alternative widths may be proposed if it is demonstrated that the alternative furthers the viability of the Natural Resource of Regional Significance, effectively separating the development impacts from the natural resource or contributing to reduced fragmentation of identified Natural Resources of Regional Significance.

3.1.11 Implement monitoring and maintenance of Natural Resources of Regional Significance and other suitable natural resources so that an Overall Positive Gain in quality and quantity of the Natural Resources of Regional Significance is achieved. The monitoring of the Natural Resources of Regional Significance shall be included on all projects that have not been demonstrated to not adversely impact the resource or associated listed species.

3.1.19 Uses of the land shall be consistent with the sustained ecological functioning of the Natural Resources of Regional Significance and suitable adjacent natural buffer areas and will be based upon the radius required to provide protection to the natural system and associated inhabitants. The radius will vary in size depending upon the resource or species that is to be protected.

Strategic Regional Goal

3.4 Improve the protection of upland habitat areas and maximize the interrelationships between the wetland and upland components of the natural system.

Regional Policies

3.4.1 Require the utilization of vegetation and wildlife surveys in project review which include the identification of listed species habitat quantity and quality.

3.4.2 Utilize the results of the vegetation, wildlife and listed species habitat surveys in the reduction of project related impacts to identified wildlife populations or communities. The results of the surveys will be utilized to ensure that the proposed project is compatible with identified or otherwise documented on-site viable populations or communities by retaining those populations or communities on-site.

3.4.4 Require the use of ecological studies and site and species specific surveys in projects that may impact natural habitat areas to ensure that rare and state and federally listed plants and wildlife are identified with respect to temporal and spatial distribution.

3.4.5 Identify and protect the habitats of rare and state and federally listed species. For those rare and threatened species that have been scientifically demonstrated by past or site specific studies to be relocated successfully, without resulting in harm to the relocated or receiving populations, and where *in-situ* preservation is neither possible nor desirable from an ecological perspective, identify suitable receptor sites, guaranteed to be preserved and managed in perpetuity for the protection of the relocated species that will be utilized for the relocation of such rare or listed plants and animals made necessary by unavoidable project impacts. Consistent use of the site by endangered species, or documented endangered species habitat on-site shall be preserved on-site.

3.4.8 Remove invasive exotics from all Natural Resources of Regional Significance and associated buffer areas. Require the continued regular and periodic maintenance of areas that have had invasive exotics removed.

3.4.9 Required maintenance shall insure that re-establishment of the invasive exotic does not occur.

Strategic Regional Goal

3.5 Develop a plan for public access that delineates the Natural Resources of Regional Significance and high quality natural areas compatible with human recreation and promotes the ecologically sensitive use of suitable Natural Resources of Regional

Regional Policies

3.5.1 Identify the elements of each Natural Resource of Regional Significance and other suitable natural resources of the region and implement protection, restoration, and management of these elements that encourages public use. This shall include the identification of suitable additional beach access areas that allow for effective public transportation and private vehicle parking. Such needs shall be addressed by the incorporation of shared use parking areas and public transportation pick-up and drop-off points.

Strategic Regional Goal

3.8 Enhance and preserve natural system values of South Florida's shorelines, estuaries, benthic communities, fisheries, and associated habitats, including but not limited to, Florida Bay, Biscayne Bay and the coral reef tract.

Regional Policies

3.8.1 Enhance and preserve natural shoreline characteristics through requirements resulting from the review of proposed projects and in the implementation of ICE, including but not limited to, mangroves, beaches and dunes through prohibition of structural shoreline stabilization methods except to protect existing navigation channels, maintain reasonable riparian access, or allow an activity in the public interest as determined by applicable state and federal permitting criteria.

3.8.2 Enhance and preserve benthic communities, including but not limited to seagrass and shellfish beds, and coral habitats, by allowing only that dredge and fill activity, artificial shading of habitat areas, or destruction from boats that is the least amount practicable, and by encouraging permanent mooring facilities. Dredge and fill activities may occur on submerged lands in the Florida Keys only as permitted by the Monroe County Land Development Regulations. It must be demonstrated pursuant to the review of the proposed project features that the activities included in the proposed project do not cause permanent, adverse natural system impacts.

3.8.3 As a result of proposed project reviews, include conditions that result in a project that enhances and preserves marine and estuarine water quality by:

a) improving the timing and quality of freshwater inflows;
b) reducing turbidity, nutrient loading and bacterial loading from wastewater facilities and vessels;
c) reducing the number of improperly maintained stormwater systems; and
d) requiring port facilities and marinas to implement hazardous materials spill plans.

3.8.4 Enhance and preserve commercial and sports fisheries through monitoring, research, best management practices for fish harvesting and protection of nursery habitat and include the resulting information in educational programs throughout the region. Identified nursery habitat shall be protected through the inclusion of suitable habitat protective features including, but not limited to:

a) avoidance of project impacts within habitat area;
b) replacement of habitat area impacted by proposed project; or
c) improvement of remaining habitat area within remainder of proposed project area.

3.8.5 Enhance and preserve habitat for endangered and threatened marine species by the preservation of identified endangered species habitat and populations. For threatened species or species of critical concern, on-site preservation will be required unless it is demonstrated that off-site mitigation will not adversely impact the viability or number of individuals of the species.

Thank you for the opportunity to comment. We would appreciate being kept informed on the progress of this project. Please do not hesitate to call if you have any questions or comments.

Sincerely,

Eric Silva

Eric Silva
Council Staff

ES/cp

cc: Ralph Cantral, FCMP
Michael Wanchick, Broward County
Guillermo E. Olmedillo, Dade County
Michael Busha, TCRPC

RESPONSE TO COMMENTS FROM THE FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS (STATE CLEARINGHOUSE), LETTER DATED OCTOBER 11, 1986.

1. Paragraph 2. "The DEP suggests that separate Supplemental Environmental Impact Statements be prepared to accompany the General Design Memorandum for each of the projects contained in the draft EIS and to include: ..."

Response: The feasibility report and EIS are recommending only three project segments for Federal participation. The recommended project segments are the Lake Worth Inlet sand transfer plant (STP), the South Lake Worth Inlet STP and beach nourishment along 0.6 miles of shoreline at Dania. The remaining project segments discussed in sections 2.4 through 2.4.3.5 of the DEIS are not recommended for authorization at this time. The Corps does not anticipate that the construction of the STPs, sand bypassing or beach nourishment at Dania would significantly affect fish and wildlife resources. To ensure that impacts are minimized, additional environmental studies would be conducted and the adequate level of supplemental NEPA documentation would be prepared during planning, engineering and design phase for each of the recommended project segments authorized. The same would apply to any of the other project segments if they are considered in the future. The Department of Environmental Protection recommendations would be considered in any supplemental NEPA document prepared.

2. Paragraph 3. City of Boca Raton Comment (refer to paragraph 2. in the letter from the City of Boca Raton dated August 26, 1996, enclosed with the State Clearinghouse letter). "Page 69 Paragraph 162. Boca Raton: The berm width listed in this paragraph is 20 feet."

Response: This paragraph is a description from the "Intermediate Assessment of Alternatives" section. As described in the "Detailed Alternative Plans" (Paragraph 198) and "Recommended Plan" (Paragraph 266) sections of the feasibility report, no additional berm width extension, beyond the presently authorized project has been identified in the assessment of the NED Plan. The zero berm width in the summary table means that the report does not recommend modification of the Boca Raton project segment at this time. The berm width in the COF report (20 feet) is different that the berm width (50 feet) in the GDM under preparation by the City of Boca Raton. The GDM reflects data (surveys, real estate appraisal) not available to the COF study. The COF report is based on 1990 survey data and real estate information. Since the GDM will be the document used for renourishment, the GDM will serve as the basis for approval of the design berm. The only NED project modifications identified for Boca Raton, beyond the presently authorized project, includes extension of Federal participation from 10 years from completion of construction to 50 years from the start of construction and a nearshore berm site as an alternative maintenance dredged material disposal site.

3. Paragraph 3. Comment from the City of Delray Beach (refer to letter dated August 22, 1996, enclose with the State Clearinghouse letter). "The inconsistency lies in the proposed reduction in the Federal participation in the project ... ."

Response: This is a misunderstanding. As identified in the City's letter, only a portion of the report was reviewed, through the section entitled "Formulation of Alternative Plans." The

"Detailed Alternative Plan" (Paragraph 196) and the "Recommended Plan" (Paragraph 264) for the Delray project segment is recommended for modification with a 20 feet berm width extension.

The 1987 GDM for Palm Beach County describes the NED plan for Delray Beach as continued periodic nourishment of the constructed project. The constructed project extended MHW by 100 feet, as authorized. The 1992 GDM prepared for the 3rd periodic nourishment does describe the project as a 100-foot extension of the berm, but this description is in error. The authorized project calls for extending the mean high water 100 feet. Except for the 1992 GDM, all of the study and design documents for this project reflect a 100-foot extension of the MHW. The 20-foot extension of the berm will result in a slightly larger beach than the project that results from extension of the MHW by 100 feet.

The 1987 GDM called for an 8-year nourishment interval. The 1992 GDM reported the periodic nourishment interval at 9 years. This feasibility report indicates that the renourishment interval should be 7 years. The periodic nourishment interval is dependent on volume and dredging cost estimates. This number will varying between 6 and 10 years at this site due to the conditions and price levels at the time of the nourishment.

Also, although the project component is a considerable distance from either inlet, an extensive nearshore berm site offshore of this project component is also recommended as a potential dredged material disposal site, for future consideration.

3. Paragraph 5. "Based on the information contained in the draft feasibility report, draft EIS and the enclosed comments provided by our reviewing agencies, the state has determined that, at this stage, the above referenced project is consistent with the Florida Coastal Zone Management Program (FCZMP)."

Reponse: Acknowledged.

Beaches and Nearshore Habitats
I n i t i a t i v e

A joint program of the American Littoral Society and Coastal Research & Education

October 10, 1996

American Littoral Society
2809 Bird Avenue - Suite 162
Miami, FL 33133

Colonel Terry L. Rice, District Engineer
Jacksonville District
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232

re: Draft Feasibility Report for
Coast of Florida Erosion and
Storm Effects Study (Region III)

Dear sir:

This letter is in response to the request for public comments on the Draft Feasibility Report for the Coast of Florida Erosion and Storm Effects Study (Region III).

The Beaches and Nearshore Habitats Initiative is a joint effort of the American Littoral Society, Inc. and of Coastal Research & Education, Inc -- both Florida non-profit organizations whose mission and memberships give them standing in any matter regarding beach management in the State of Florida. The American Littoral Society is a non-profit membership organization dedicated to the conservation of marine life and habitat throughout the coastal zone. Coastal Research & Education is a non-profit service organization dedicated to the initiation of innovative and results-oriented research and education programs which optimize the management of critical coastal resources. The Beaches and Nearshore Habitats Initiative is dedicated to the achievement of environmentally sound management and restoration of Florida's beaches while preserving the state's fragile nearshore marine habitats from dredging and sedimentation burial.

Based on the above considerations, we have found several specific items in the Draft Feasibility Report that would materially improve environmental safeguards to nearshore habitats, and several other items which require revision in order to be fully aligned with environmentally sound beach management criteria.

We strongly agree with the concept of considering together the three counties of Dade, Broward and Palm Beach for beach renourishment planning purposes, since this much more realistically applies ecosystem management perspectives to how natural processes work to affect beaches across these three counties.

The proposed incorporation of 400-foot no-dredge buffer zones around hardbottom habitats in the vicinity of borrow areas is a major improvement over the current unofficial "standard" of 200-foot buffer zones. However, we have long advocated 600-foot buffer zones based on the existing record of reef-damaging dredging accidents that have ocurred in spite of the aforementioned 200-foot buffer zones, and we restate our request for incorporation of 600-foot no-dredge buffer zones around hardbottom habitats in the vicinity of sand dredging operations.

The Draft Feasibility Report concludes that as many as 31 acres of nearshore hardbottom in Palm Beach County, 25 acres in Broward County, and 5 acres in Dade County will be buried outright as a result of beach renourishment actions. Although the Draft Feasibility Report (DFR) refers to plans for mitigating this "unavoidable" damage to nearshore hardbottom habitats impacted by the actual construction of beaches, no specifics are given for that mitigation. We ask that there be a minimum 2-to-1 mitigation ratio for buried or otherwise impacted nearshore hardbottom. The DFR indicates that any lost or destroyed nearshore hardbottom will be replaced by "artificial reefs, boulders of concrete or any other artificial technology". We ask that the mitigation consist of constructing coquina boulder artificial reefs as close as possible to the original location of the impacted hardbottoms.

We strongly agree with the concept of mitigation, but we strongly recommend the further use of preventive strategies -- such as no-dredge buffer zones and inlet sand bypassing -- to limit reef destruction without having to go into mitigation. In that regard, we endorse the DFR's plans for implementing inlet sand bypassing at Lake Worth Inlet and South Lake Worth Inlet -- but we also ask for a more aggressive application of that strategy to the rest of the inlets in the Region.

Although, as stated, the DFR proposes strategy changes that will enhance safeguards for nearshore hardbottoms and offshore reefs, we still maintain that the Draft Feasibility Report is still deficient in its consideration and application of the following strategic concepts:

(1) The importance of increasing no-dredge buffer zones to ensure protection of coral reefs from excess sedimentation, siltation, burial and physical damage from sand mining and placement operations.

(2) The importance and cost effectiveness of applying inlet sand bypassing at all 8 inlets found within Region III, in order to reduce nearshore hardbottom burial, rescue scarce beach quality sand that would otherwise be lost to the littoral system, and help reduce the costs associated with renourishment projects.

(3) The need to include in the DFR's Environmental Impact Statement a formal risk analysis of expectable impacts to offshore reefs, which is totally lacking now in the DFR.

(4) The need to fully assess the possible impacts of nearshore sand berms upon nearby hardbottoms.

(5) The need to develop renourishment schedules that fully protect federally

listed endangered and threatened turtle species by timing renourishment operations so that they avoid the known summer turtle nesting season.

(6) The importance of requiring detailed mapping of all seagrass beds, nearshore hardbottom habitats and offshore reefs in the vicinity of a beach renourishment project before final project permitting and operations.

Finally, but most importantly, we must insist on specific assurances that the development of this DFR and its Environmental Impact Statement will not result in the waiving of Environmental Assessment requirements for each specific project included in the DFR. The DFR deals with environmental considerations only in general terms, and it will be essential that each project provide a more specific environmental assessment in order for that project to be in compliance with National Environmental Procedures Act (NEPA) requirements.

Importance of 600-foot No-Dredge Buffer Zones

We request an increase in the no-dredge buffer zones to 600 feet to ensure that offshore reefs near dredging operations will not be destroyed again by dredging accidents.

To fully evaluate the importance of preventing destruction of coral colonies, we must take into account that stony corals are -- in human terms -- a non-renewable resource, and have been classified as such by the South Atlantic Fishery Management Council and the Caribbean Fishery Management Council (SAFMC,1995). The reason for classifying corals as non-renewable is their slow rate of growth. For example, it may take from 80 to 250 years for a single colony of star coral *(siderastrea)* to reach a size of 1 meter, and from 400 to 1250 years to reach 5 meters (McConnaughey, 1983). Coral growth is therefore more appropriately measured on a geologic time scale, rather than a biological one.

A knee-high coral could be hundreds of years old. If it is destroyed by a dredging accident or if it is buried by silt from the dredging, that coral will not be replaced for hundreds of years. In terms of human lifetimes, that makes corals a non-renewable resource. And that is why it is so important to increase buffer zones around coral reefs which could be impacted by dredging operations.

To fully evaluate our request, we must also keep in mind that dredging accidents around coral reefs happen with alarming frequency.

In a 1988 example, two acres of natural coral reef were damaged or destroyed by a dredge during the rebuilding of Miami's Sunny Isles Beach. The damage was depicted as some of the severest reef destruction in modern Southern Florida history. Even though buffer zones were set at 200 feet to the nearest coral reefs, the dredgers strayed off course and plowed 150 feet into coral habitat without the dredge operators ever becoming aware of it. A 600 foot buffer zone would greatly reduce the chances of something like this ever happening again.

Using past accidents as experience for the future, we strongly request that a minimum 600 foot buffer zone be used to keep dredging operations away from coral habitats and that deployment of lighted buoys marking the buffer zone be required. Only such requirements can prevent future damage to regional coral habitat during dredging operations. If we can increase buffer zones then we can save acres of reefs without having to go into mitigation.

Importance of Regionwide Inlet Sand Bypassing

The second request we are making is for the use of inlet sand bypassing at all inlets in Region III, except for Government Cut. The Coast of Florida Erosion and Storm Effects Study only mentions the implementation of sand bypassing at two inlets, Lake Worth Inlet and South Lake Worth Inlet. But Region III includes seven inlets where sand bypassing could be used as a partial offset to dredge-and-dump beach renourishment projects.

Inlet sand bypassing should not be considered just as a lower-tier alternative to beach renourishment. Instead, wherever possible, it should be used as the standard starting point for beach erosion control of downdrift beaches, with beach renourishment as a supplement to the inlet sand bypassing.

Many examples exist of the proven benefits of inlet sand bypassing. At Ponce de Leon Inlet, bypassing sand from the inlet and placing it on the beach north of the inlet appears to stabilize the navigation channel and retard erosion north of the inlet (Jones, 1980). At Jupiter Inlet, the bypassing operation has been partially successful in reducing beach erosion and ensuring adequate navigation depths through the inlet (ibid.). Examples of successful inlet bypassing practices have also been documented at Sebastian Inlet, Lake Worth Inlet, Boca Raton Inlet and Hillsboro Inlet.

At specific sites, inlet sand bypassing could prove crucial to protecting nearshore hardbottom habitats. The proposed DFR estimates that 31, 25, and 5 acres of nearshore hardbottom in Palm Beach, Broward, and Dade Counties, respectively, would be destroyed as a result of renourishment projects. The use of inlet sand bypassing systems could reduce the burial of nearshore habitats across these three counties.

Inlet sand bypassing would reduce the magnitude of beach renourishment projects, which are designed to widen out beaches to compensate for 6-to10-year erosion cycles. Since inlet sand bypassing would be providing salvaged sand to the inlet's downdrift beach on a continuous basis, this would significantly reduce the amount of sand needed to be deposited nearshore during each beach renourishment cycle. The resulting reduction in the width of the beach renourishment project would reduce the amount of nearshore hardbottom buried by the project.

Not only will inlet bypassing operations help coral reefs but they will also, once operating, reduce the cost of beach management. In a 1988 study of sand bypassing alternatives for the Port Everglades Inlet, results showed that inlet bypassing would save money in comparison to only utilizing beach renourishment to maintain the downdrift beach at John U. Lloyd State Recreation Area (Coastal Technology Corporation, 1988).

In Palm Beach County, 4 inlets with inlet bypassing potential are found: (1) Jupiter Inlet, (2) Lake Worth Inlet, (3) South Lake Worth (Boyton) Inlet, and (4) Boca Raton Inlet. Broward County contains a total of 2 usable inlets: (1) Hillsboro Inlet, and (2) Port Everglades

Inlet. Dade County also has one inlet (Bakers Haulover) where sand bypassing should be considered.

Table 2.1 in the DFR, titled " Presently Proposed Combination of Alternatives: Palm Beach County, Broward County and Dade County" mentions but does not indicate any use of inlet sand bypassing for any of the listed beaches. We request specific clarification on why only 2 of the above-mentioned 7 inlets have been proposed for inlet sand bypassing implementation or supported continuation.

We cannot understand why the DFR has discounted the implementation of sand bypassing at some of these inlets, and most particularly at Broward and Dade County inlets. The use of sand bypassing at most of these inlets would help reduce overall costs of downdrfit beach renourishment projects. It would save extremely scarce beach quality offshore sand resources for use on other beaches. And it would spare countless acres of nearshore hardbottom from sedimentation and burial by making it possible for beach renourishment projects downdrift of inlets to be scaled down thanks to the steady stream of sand that would be contributed to those beaches by the inlet sand bypassing.

We request the utilization or continuation of inlet sand bypassing systems at these specific sites:

(1) Jupiter Inlet: to supply sand to Ocean Cay/Juno Beach
(2) Lake Worth Inlet: to supply sand to North-End Palm Beach
(3) South Lake Worth Inlet: to supply sand to Ocean Ridge
(4) Boca Raton Inlet: to supply sand to Deerfield Beach, with Boca Raton acting as a feeder beach
(5) Hillsboro Inlet: to supply sand to Pompano Beach/Lauderdale by the Sea
(6) Port Everglades Inlet: to supply sand to John U. Lloyd Beach
(7) Bakers Haulover Inlet: to provide sand to Bal Harbour

Offshore Reef Impacts Need Formal Risk Analysis

Our third request is for incorporation in the DFR of formal risk analysis regarding impacts to coral reefs near proposed dredging operations.

Under NEPA, Environmental Impact Statements produced by other federal agencies such as the Minerals Management Service (MMS, 1994) provide specific and detailed narrative and chart analysis of the probability of impacts and the expected severity of impacts to nearby coral reefs and other significant benthic habitats. The Army Corps of Engineers should do the same in this DFR, providing a clear, documented, and understandable ranking of impact probabilities and severities for various action alternatives considered in the DFR.

For an official environmental impact statement such as is incorporated in the DFR, general and vague declarations are insufficient and unacceptable. The DFR discounts the risk that offshore reefs face from dredging operations without presenting any justification for the discounting. The DFR categorizes mechanical damage to the reefs as unlikely, without presenting any analysis to support that conclusion. Given that very similar operations have repeatedly in the past resulted in significant and even catastrophic damage to coral reef habitats, a more responsible and formal analysis of the risks to coral reefs of the proposed actions is clearly called for.

Past experience shows that physical dredging damage due to human error is indeed likely. In fact, coral reefs are mostly damaged by dredging. Poorly planned and implemented dredging operations have caused the demise of many reefs. Straughan (1972) condemned dredging for the destruction of some Florida Keys reefs. Poor planning at a beach renourishment dredging project off Hallandale, Florida resulted in reef burial. Blair and Flynn (1988) documented the destruction of 2 acres of coral reefs at another beach renourishment project in the Miami area. The DFR cannot proceed, therefore, on the unjustified assumption that errors and accidents will not occur. They do. They have. The risk of them happening again must be rigorously evaluated via formal risk analysis, so that appropriate safeguards and actions may be implemented.

To determine what should be covered in such a risk analysis, we must consider how dredging has been shown to affect coral reefs.

Dredging operations pose three main risks to coral reefs: (1) physical damage; (2) sediment loading from the dredge plume; and (3) increases in turbidity. (Marszalek, 1981). The first two categories produce catastrophic damage.

Physical Damage

The physical impacts of dredge anchors, cables, chains, pipes, and suction and cutting heads deployed in the vicinity of coral all too often include crushing of coral, dislodging and overturning of coral heads, and the infliction of lesions that lead to infection and death of the coral colonies (U.S. Department of the Interior, Minerals Managent Service 1984).

But physical damage from dredging accidents can be much more catastrophic. In a1988 example, two acres of natural coral reef were damaged or destroyed by a dredge during the rebuilding of Miami's Sunny Isles Beach. The damage was depicted as some of the severest reef destruction in modern South Florida history, according to Carlos Espinosa, then Chief of the Water Management Division of the county's Department of Environmental Resources Management.

Even though the dredging zone was established with dredging barge paths no closer than 200 feet to the nearest coral areas, this did not prevent the damage. The dredge strayed off its charted course and plowed as much as 150 feet into coral habitat without the dredge operators ever becoming aware of it. The dredge was pulled over the reef numerous times, in a path of destruction in some places 350 feet wide (Blair and Flynn, 1988). Even when chunks of broken coral began spewing out of the dredge suction pipe, the barge operators assumed it was relic material buried under the sand pocket they were working.

Sedimentation

Silt created by dredging remains in the local area for long periods and is resuspended during storms. Natural resuspension can also be compounded by the presence of silt fill discharged at the dredge site by hopper dredges.

The usual result of chronic sedimentation is stressed corals susceptible to disease. The occasional result is reef habitat totally buried under discharged dredge silt sediment, as in the case of Torrecilla Lagoon, Puerto Rico, where sedimentation from dredging almost destroyed coral reefs northwest of Boca de Cangrejos (cited in Goenaga and Boulon, 1992).

Turbidity

Stony corals , in particular, are susceptible to the effects of elevated levels of turbidity due to dredging (Dodge et al., 1974; Loya, 1976; Dodge and Vaisnys, 1977; Bak, 1978; Lasker, 1980; Marszalek, 1981; Rogers, 1983).

High turbidity resulting from fine suspended particles generated by dredging decreases the amount of light (a vital source of energy) available to corals for the photosynthetic fixation of calcium carbonate (Johannes, 1975), thus reducing coral calcification (growth) rates (Goreau, 1961; Lasker, 1980). Turbidity also clogs the filter feeding mechanisms of coral polyps and causes continual energy losses by the necessity of continuous shedding of the protective mucus layer secreted by coral polyps (Lasker, 1980; Dallmayer et al., 1982).

Moreover, sediments excavated by dredging are often anaerobic and bind up available dissolved oxygen. This forces reef organisms to increase respiration to remove silt, further lowering dissolved oxygen levels. Coupled with this increased respiration is reduced photosynthesis and oxygen production due to lowered light levels.

The usual result of chronic siltation is stressed corals susceptible to disease. The quantity of turbidity and the length of time required for exertion of its maximum stress effect is not known, but corals that are stressed expel essential symbiotic zooxanthellae and take on a pallid appearance prior to mortality (Goreau, 1964; Rogers, 1979; Glynn et al., 1984). Generally, mortality ensues within six weeks of such reactions.

Dredging operations should not and must not be allowed to destroy reef habitat. Once the reefs have been impacted, aesthetic, educational and scientific value all go down. These are negatives for Florida's economy and environment -- and the risks should be understood clearly. For this very reason, we are asking that the DFR include a Risk Analysis Section on the Effects of Dredging on Coral Reefs, with formal evaluation of impact probabilites and expectable impact severities for the various actions proposed in the DFR.

Nearshore Berm Impacts Need Examination

The DFR introduces the use of submerged nearshore sand berms to be used as feeders for beaches. We are concerned about the possible impacts which such nearshore berms could have on nearby hardbottoms and seagrass beds.

Since the nearshore berms would be constructed with the dredged sand, we must expect that the berms will contain significant portions of silt and fines, and that they -- just like renourished beaches -- will produce chronic silt fines for years after construction. The sobering difference is that the berms would be much closer to any nearby nearshore hardbottoms -- and that has to be adequately considered in the DFR. The extend to which berm silt plumes would affect and impact hardbottoms must be covered in the DFR and incorporated into the risk analysis requested above. In addition, a risk assessment must be made of the possible total shifting of the sand berm onto hardbottom habitat as the result of a storm. The probability of such an occurrence, and the severity of impact, must be evaluated.

Based on that requested analysis, the DFR should not consider the use of nearshore sand berms wherever the analysis shows that nearshore hardbottoms would be placed at significant risk of damage or impact due sand berm effects.

Project Scheduling Should Avoid Turtle Nesting Season

According to the DFR, 61 miles of renourished beaches will be produced in DFR proposed actions for Region III. The DFR describes how these new miles of beaches will benefit endangered turtles by providing incresed nesting habitat. However, we are greatly concerned about the impacts that endangered turtles will face from each proposed project as it is being constructed, if such construction occurs during turtle nesting season's summer months.

Sea turtle nesting peaks during the summer months of the year. It is extremely important that nesting beaches not be disturbed during these months so that sea turtle nesting is not in any way altered by beach renourishment operations. We request that summer dredging be limited to a minimum wherever possible.

Another unexplored issue in the DFR is the effects of incompatible sand on endangered sea turtles. The sand which is chosen to be used for renourishment must provide the same texture, temperature and weight as the sand which is currently used by turtles for nesting. Inappropriate sand could have catastrophic consequences for sea turtles populations by, for example, altering hatchling sex ratios due to improper temperature gradients in the nest. Also, nesting would be unsuccesful if inappropriate sand caused the collapse of nests due to improper sand texture, or if hatchlings were unable to dig out of the nest.

Night dredging should also be kept to a minimum because this is when turtles are most likely to begin their journeys toward shore. Limiting night dredging would greatly reduce accidents from machinery operations on sea turtles and would limit noises and disturbances which would scare the turtles and force them not to travel towards the beaches for nesting purposes. All these factors must be addressed in the DFR before it declares the construction of 61 miles of new beach to be wholly beneficial to the endangered turtles.

Hardbottoms Must Be Adequately Mapped

To limit hardbottom and coral reef destruction, we also request detailed mapping of all seagrass, hardbottom and coral reef habitats in the vicinity of each proposed beach renourishment project before that project's design is finalized and its permits issued. This must be a preconstruction requirement for both sand deposition areas nearshore and dredging areas offshore. Mapping will help reduce navigational error due to the lack of knowledge of where such very fragile habitats can be found. Detailed mapping would reduce the risk of damage to acres of offshore reefs and nearshore hardbottoms.

In Conclusion

Coral reefs must be protected from dredging operations in order to ensure their ongoing survival. We need further action to be taken within the context of this DFR before Region III beach renourishment operations go forward. The DFR, although containing several significant improvements in habitat safeguarding, still needs further work in order to ensure protection to sensitive marine habitats. Even though some of the proposals in the DFR have come a long way towards a more environmentally safe policy, the need for further protection is required and requested, based on the above comments.

Finally, but most importantly, we must insist on specific assurances that the development of this DFR and its Environmental Impact Statement will not result in the waiving of Environmental Assessment requirements for each specific project included in the DFR. The DFR deals with environmental considerations only in general terms, and it will be essential that each project provide a more specific environmental assessment in order for that project to be in compliance with National Environmental Procedures Act (NEPA) requirements.

Thank you for this opportunity to comment. We look forward to your responses and to the incorporation of our requests and recommendations in the Final Feasibility Report for the Coast of Florida Erosion and Storm Effects Study for Region III.

Sincerely,

Alexander Stone

ALEXANDER STONE
Director
American Littoral Society, Inc.
(305) 358-4600
(FAX) 358-3030

RESPONSE TO COMMENTS FROM THE BEACHES AND NEARSHORE INITIATIVE, LETTER DATED OCTOBER 10, 1996.

Recommends 600 foot no dredge buffer zones around hardbottom habitats.

Response: Throughout our involvement in the activity and in coordination with the Florida Department of Environmental Protection, local sponsors, and county environmental resource management agencies, we have evaluated the impacts of this activity and explored various measures to minimize adverse impact to hardbottoms. Measures currently employed include lighted bouys, sediment/turbidity monitoring, diver monitoring for reef impacts, real-time Global Positioning Systems (GPS), and requirement for continuous movement of dredging activity the length of the borrow site. Other factors such as currents and wave climate may also influence the potential impact to reef and other hardbottoms.

Improvements in technology and dredging technique have reduced (and will probably continue to reduce) the risk of damage to reef and other hardbottoms in the vicinity of the off-shore borrow sites. We will continue to adopt methods and buffer zone widths acceptable to the Federal, State, and local agencies having authority and expertise on this matter.

Recommends 2:1 mitigation ratio.

Response: The mitigation ratio very often involves a 2:1 or greater ratio of effective hardbottom surface area for mitigation. Depending on the amount and kind or resource impacted, the actual level and method of mitigation has varied from concrete rubble reefs to limestone boulders to construction of fields of special reef modules as described in the draft EIS (pages EIS-54 & 55).

Recommends coquina boulder artificial reefs.

Response: While natural limestone has been common component of such mitigation, we have not used coquina boulders for such mitigation. Coquina is not native to the region III area. In addition, we are not aware of coquina boulder sources which would be economically competative with natural limestone. We do not beleive it appropriate to mine coquina from off-shore or beaches along areas of Florida's coast where it presently occurs. If economic and environmentally acceptable sources of coquina become available, we would examine this as a potential source of mitigation material worthy of further investigation.

Recommends additional inlet bypassing.

Response: Sand transfer plants at Lake Worth and South Lake Worth Inlets were found beneficial and cost effective for the National Economic Development (NED). Sand transfer plants at "all" inlets in the Region III study area would not necessarily be in the Federal interest or the best engineering solution to the interuption of sand transport at the inlets. The Corps will continue to examine the potential for sand transfer plants and other means of reducing the impact of inlets on the littoral transport of sand.

Recommends "formal risk analysis" of impacts to offshore reefs.

Response: Because of continual changes in technology and technique and other variables, a formal risk analysis would be of questionable value. The report, however, fulfills the requirements of part 6-133 of Engineer Regulation ER 1105-2-100 on Evaluation Procedure: Risk and Uncertainty. As stated above, it is reasonable to assume that improvements in monitoring, dredge positioning, and other techniques would progressively reduce risks to environmental resources from shore protection activities.

Need to fully assess the possible impacts of nearshore sand berms upon nearby hardbottoms.

Response: Impacts of nearshore sand berms on nearby hardbottoms are evaluated in much the same manner as for beach placement. The equilibrium profile of the fill is considered in determining impacts to nearby environmental resources.

Need to avoid turtle nestling season.

Response: As protected species, sea turtles are an issue of concern. We continue to conduct extensive coordination with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the State agencies on protected species issues (see sections 4.3.1.1 & 4.3.2.1 of the EIS). Avoiding beach placement during the turtle nesting season is not necessarily appropriate for all segments of the Region III study. For example in Dade County, the nests are routinely identified and relocated to a safe hatchery whether beach nourishment is taking place or not.

Need detailed mapping of all seagrass beds, nearshore hardbottom habitats and offshore reefs in the vicinity of a beach renourishment project before final project permitting and operations.

Response: As stated in the EIS, we will conduct a more detailed evaluation of environmental resources as more specific project plans are developed and proposed for construction.

Insist on specific NEPA documentation for each project in the report.

Response: For each project segment, we will evaluate the scope and potential impacts. If the scope and impacts of any segment proposed for construction are not adequately addressed in the EIS and feasibility report, we will prepare the adequate level of supplemental NEPA documentation.

STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS
EMERGENCY MANAGEMENT • HOUSING AND COMMUNITY DEVELOPMENT • RESOURCE PLANNING AND MANAGEMENT

LAWTON CHILES
Governor

JAMES F. MURLEY
Secretary

October 4, 1996

Mr. A. J. Salem
Department of the Army
Jacksonville District Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

RE: Department of the Army - Beach Erosion Control Projects - Draft Feasibility Report - Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III - Palm Beach, Broward and Dade Counties, Florida
SAI: FL9608020623C

Dear Mr. Salem:

The Florida State Clearinghouse has received your notification of the above-described project, and has forwarded it to the appropriate state agencies for review. In order to receive comments from all agencies, an additional fifteen days is requested for completion of the review. Therefore, the clearance letter due date for this project will be extended from October 1, 1996, to October 16, 1996. If all comments are received prior to the extended date, every effort will be made to forward the clearance letter to you at an earlier date.

Thank you for your understanding. If you have any questions regarding this matter, please contact Ms. Keri Akers, Clearinghouse Coordinator, at (904) 922-5438.

Sincerely,

Ralph Cantral, Executive Director
Florida Coastal Management Program

STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS
EMERGENCY MANAGEMENT • HOUSING AND COMMUNITY DEVELOPMENT • RESOURCE PLANNING AND MANAGEMENT

LAWTON CHILES
Governor

JAMES F. MURLEY
Secretary

September 13, 1996

Mr. A. J. Salem
Department of the Army
Jacksonville District Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

RE: Department of the Army - Beach Erosion Control Projects - Draft Feasibility Report - Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III - Palm Beach, Broward and Dade Counties, Florida
SAI: FL9608020623C

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Thank you for your understanding. If you have any questions regarding this matter, please contact Ms. Keri Akers, Clearinghouse Coordinator, at (904) 922-5438.

Sincerely,

Chris McCay

for Ralph Cantral, Executive Director
Florida Coastal Management Program

UNITED STATES DEPARTMENT OF COMMERCE
Office of the Under Secretary for
Oceans and Atmosphere
Washington, D.C. 20230

September 9, 1996

Mr. A. J. Salem
Chief, Planning Division
DOA, Jax, District COE
P.O. Box 4970
Jacksonville, FL 32232-0019

Dear Mr. Salem:

Enclosed are comments on the Draft Environmental Impact Statement for Coast of Florida Erosion and Storm Effects Study, Region III. We hope our comments will assist you. Thank you for giving us an opportunity to review this document.

Sincerely,

Donna Wieting

Donna S. Wieting
Acting Director
Ecology and Conservation Office

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive N.
St. Petersburg, Florida 33702

August 28, 1996

Colonel Terry Rice
District Engineer, Jacksonville District
Department of the Army, Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Colonel Rice:

The National Marine Fisheries Service (NMFS) has reviewed the Draft Feasibility Report and Draft Environmental Impact Statement (DEIS) for the Coast of Florida Erosion and Storm Effects Study, Region III (COFS) dated August 1, 1996. The report summarizes and recommends solutions for the beach erosion and storm damage problems of the southeast Atlantic coast of Florida including Palm Beach, Broward, and Dade Counties. Beach nourishment is the recommended solution for most of the shorelines identified in the study. Nearshore berms also are proposed as are sand bypass plants.

Beach nourishment activities result in adverse impacts to three major types of fishery habitat: softground, hardground, and seagrasses. Section 4.3.1.4 of the DEIS describes the impacts to softground habitat and Section 4.3.2.4 states: "Although major loss of softground fauna and infauna may occur in some borrow and fill areas in the short-term from COFS projects, no long term (longer than several years) and, therefore, no significant adverse impacts are anticipated from COFS actions. Accordingly, no mitigation would be necessary for impacts to softbottom communities." In Palm Beach County 21.79 linear miles of shoreline will be nourished. Broward County will have 21.8 linear miles of beach nourished, and in Dade County 15.35 linear miles of nourishment are proposed. In total 58.94 linear miles will be nourished. While each of the respective segments may seem small and pose no significant impact by itself, nearly 59 miles in total will be impacted. Also, Section 219 of the COFS indicates that combining nourishment activities will yield cost savings primarily due to the high cost of mobilizing equipment. If this is the case, then larger sections of beach will be impacted. The impact of nourishing several miles of beach at a time will affect the softbottom communities' ability to replace itself. In addition to the softbottom community being affected, the fisheries that use the benthic fauna and infauna for food chain support will also be adversely affected. Accordingly, we recommend that sections 4.3.1.4 and 4.3.2.4 of the DEIS be re-evaluated in light the publication titled, **A Review and Synthesis of Data of Surf Zone Fishes and Invertebrates in the South Atlantic Bight and the Potential Impacts from Beach Renourishment,** Edited by Courtney T. Hackney, Martin H. Posey, Steve W. Ross and Amy R. Norris and prepared for the Wilmington District, US Army Corps of Engineers, Wilmington, North Carolina, May 1996.

Hardground impacts resulting from COFS recommendations in Palm Beach County include 1.7 acres at Ocean Cay/Juno (Section 255), 18 acres at North-end Palm Beach Island (Section 259), 3.65 acres at Palm Beach Island Mid-town (Section 260), and 5.4 acres at South-end Palm Beach Island (Section 261). Total hardground impacts for Palm Beach County are 28.75 acres. Broward County hardground impacts include 4.65 acres at Deerfield Beach/Hillsboro Beach (Section 268), 12.25 acres at Pompano/Lauderdale-By-The-Sea (Section 270), and 18 acres at Fort Lauderdale (Section 271) for a total of 34.9 acres. Dade County hardground impacts include only 5.25 acres at Golden Beach (Section 278/279); however, this may be a high quality area. The DEIS should indicate if this area has ever been subject to nourishment activities in the past. If it has not, it may be difficult to mitigate for impacts to this area. The total acreage including all three COFS counties is 68.9 acres. Given the large amount of hardground that may be lost as a result of the COFS, the mitigation being proposed in the DEIS may be insufficient. The NMFS refers the Corps to the South Atlantic Fishery Management Council's (SAFMC) Fishery Management Plan for Coral, Coral Reefs, and Live/Hard Bottom Habitats of the Atlantic Region (FMP). The importance of hardground habitat to fishery resources is well documented in this plan. A 0.5 to 1 mitigation to impact ratio may not be acceptable for 68.9 acres of hardground impacts.

The acreage totals used above were taken from the text of the COFS. Estimated acreage totals for both Palm Beach and Broward Counties in the COFS conflict with those presented in Section 4.3.1.3 of the DEIS. These different totals should be reconciled.

Seagrass impacts are addressed in the DEIS, but not in the COFS, and are limited to those areas being nourished at Key Biscayne, Dade County. Impact estimates range from 6 to 70 acres. Mitigation would be pursued using techniques described by Fonseca (1993). Seagrasses are one of the most important fishery habitats in south Florida for both recreational and commercial fisheries. The loss of 6.0 to 70 acres of seagrass would represent a significant adverse impact. It is highly unlikely that any project that impacts 6.0 to 70 acres of seagrass will be able to mitigate for these impacts. Out-of-kind mitigation for seagrass impacts is undesirable as many of the functions provided by seagrasses cannot be replaced. Consequently, the NMFS recommends that beach nourishment activities that adversely effect seagrasses not be pursued. The SAFMC's FMP, Amendment 3, deals specifically with seagrass habitat. This amendment contains the SAFMC policy statement for the protection and enhancement of marine submerged aquatic vegetation (SAV) habitat. The DEIS should consider the SAFMC SAV policy as it supports fishery management plans developed under the Magnuson Fishery Conservation and Management Act.

We appreciate the opportunity to provide comments on the COFS. If you have any questions regarding these comments, please contact Mr. John Iliff of our Miami Field Office at 305/595-8352.

Sincerely,

Andreas Mager, Jr.
Assistant Regional Director
Habitat Conservation Division

RESPONSE TO COMMENTS FROM THE NATIONAL MARINE FISHERIES SERVICE, LETTER DATED AUGUST 28, 1996.

1. Paragraphs 2 and 3. The feasibility report and EIS are recommending only three project segments for Federal participation. The recommended project segments are the Lake Worth Inlet sand transfer plant (STP), the South Lake Worth Inlet STP and beach nourishment along 0.6 miles of shoreline at Dania. The remaining project segments discussed in sections 2.4 through 2.4.3.5 of the DEIS are not recommended for authorization at this time. The sand transfer plants will be designed to annually bypass about 160,000 cy (Lake Worth Inlet) and 120,000 cy (South Lake Worth Inlet) of sand to the beaches south of the inlets. Actual bypassing will be performed with smaller amounts of sand discharged periodically throughout the year as needed. The recommended nourishment at Dania would involve placing sand on approximately 3,200 feet of beach between two existing projects. In this area, nearshore hardgrounds are far enough offshore they should not be impacted during nourishment activities. The Corps does not anticipate that the construction of the STPs, sand bypassing or beach nourishment at Dania would significantly affect soft or hard bottom communities in the area. To ensure that impacts are minimized, additional environmental studies and supplemental NEPA coordination will be conducted during planning, engineering and design phase for each of the recommended project segments authorized.

2. Paragraph 4. The estimated acreage totals of hardground impacts for Highland Beach (Section 265) and Fort Lauderdale (Section 271) in the feasibility report were in error. The estimated acres should be 1.9 acres for Highland Beach and 8.1 acres for Fort Lauderdale. This gives acreage totals of 30.65 for Palm Beach County, 25.0 acres for Broward County and 5.25 acres for Dade County. These figures were rounded in the DEIS to 31, 25 and 5 acres respectively. The acreage totals have been corrected in the feasibility report.

3. Paragraph 5. The proposed beach nourishment at Key Biscayne is not being recommended at this time. If considered in the future, supplemental NEPA coordination and documentation would be required and would consider SAFMC SAV policy.

FAX LETTER TO: MR. GEORGE STRAIN . FAX 904-232-3442
ARMY CORPS OF ENGINEERS, JACKSONVILLE

FROM FRANK RYSAVY, CHAIRMAN FAX & PHONE 954-764-1426
HILLSBORO INLET DISTRICT

14 August 1996

Dear George Strain:

I called today to talk to Ed Salem, and was very saddened to learn he was hospitalized on Friday due to a small stroke. Ed, Dr. Bruun, Lonnie Ryder, Harvey Sasso, and others, have helped me make practical decisions the last dozen years, at the inlet.

The Draft Feasibility Report, and Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III Ed sent to me; has been circulated for comments from the inlet board of commissioners.

I understand you will be taking over until he returns. A copy of my letter to him covering my initial observations about the studies follows for your information and use.

Please note especially my comments on page 2 paragraph 8, about Chart 72-1 in your Appendix A. This chart is in serious need of updating. Many changes have occurred since 1975.

I look forward to working with you. I remember the last time we met was at the inlet. It was almost a shocker. A USCG cutter and the Fish City Pride fishing boat came close to collision at the dog leg in our outer channel, due to some wave action at the tidal rip that forms at the east end of the jetties. Fortunately both boat captains were very capable and experienced.

On behalf of the inlet commissioners and myself, I would like you to extend our best wishes to Ed for a complete and speedy recovery. He will be remembered in our prayers.

Very truly yours,

Frank

Frank Rysavy, Chairman

HILLSBORO INLET DISTRICT
812 N.W. 6 Avenue
Ft. Lauderdale, Fl. 33311
fax and phone 954-764-1426

Mr. A.J. Salem
Chief, Planning Division
Army Corps of Engineers
Box 4970
Jacksonville, Fl. 32232-0019

05 August 1996

Dear Mr. Salem:

Thank you for revision 2 of the Draft Feasibility Report (DFR) and Draft Environmental Impact Statement (DEIS) for the Coast of Florida Erosion and Storm Effects Study, Region III for comment. It is the first report received.

Please send copies of this to the following people:

Dr. Per Bruun	Mr. Harvey Sasso
34 Baynard Cove Road	Coastal Systems International
Hilton Head Island, S.C.	464 South Dixie Highway
29928	Coral Gables, Fla. 33146

These people are very knowledgeable and helplful. I have relied on their advice to improve our operations at the Hillsboro Inlet. I will circulate the copy you sent to me, among the inlet District Commissioners.

I reviewed the reports over the weekend. I need to check further for the locations covered by some tables, charts and plates. My initial observations, which may or not be significant for your purposes, are as follows.

1. The beach south of Hillsboro Inlet channel, between monuments R-25 and R-24, is not shown. Refer to plates D-41 & D-42 in the Main Text tables.

2. It appears plate E-5 or E-6 of Appendices A thru I, cover the area of Hillsboro Beach and the inlet.

3. Table F-16, page F-21; and Table F-17, page F-22, Appendices A thru I, appear to cover Hillsboro Beach.

4. Cost benefits in the area our District impacts in the 50 year (2000 to 2050) Benefit to Cost Analysis seems included in Table F-39, page F-49; under the top two sections, Deerfield/Hillsboro Beach (R-1-25) and Pompano Beach (R-26-53). This seems combined in Table 76, page 107; and referenced on page G-10

5. The net 131,000 cubic yard sand budget south of Boca Raton on chart page D-150, may be understated. D-150 shows a 19,000 cubic yard loss offshore, and 20,000 cu.yds more lost, down to 111,000 cu.yds net when the sand arrived a short distance north of Hillsboro Inlet. Refer to chart on page D-173.

I realize, and our dredging records show that sand budgets are calculated guesstimates and sometimes conflict. The area immediately south of the Hillsboro Inlet is holding fairly close to a 50 year line, even after the severe offshore storms in the past several years. This is largely due to the volume of sand we by-pass. Broward County has been able to defer again the 7-8 year beach renourishment interval in our immediate area, done last in 1983.

The 20,000 cu.yd loss charted between Boca Raton and Deerfield/Hillsboro is an enigma. The 19,000 cubic yard offshore loss at Boca Raton seems high.

Only a 4,000 cu.yd offshore loss is estimated at Hillsboro Inlet. More water passes through Hillsboro than Boca. Records show we by-pass more than 64,000 cu.yds yearly, and are close to the 1987 Fla. statute for sand transfer

My sand budget observations are informational only. Closer study at Boca Raton and Deerfield/Hillsboro, etc., seems valuable only from an academic standpoint, rather than have any significant impact on your report validity.

6. D-173 par.D-347 you might add "....<u>commercial</u> <u>and</u> recreational...." to line 1. Also, nearby deep draft commercial boats can not use Hillsboro Inlet, and go 10 miles south on the intra-coastal to Port Everglades for ocean access

7. The District's prime concern, page D-174, has become navigation safety due to the larger boats that now do, and deep draft boats that can not use the shallow inlet channel. The beam of the larger boats now using Hillsboro Inlet exceeds the length of boats in the area during the original 1950-60's studies.

In D-175 par.D-351, 97,000 cubic yards was for 1991, not an average. Your favorable comment on our inlet operations, page D-176 par.D-356 is appreciated

8. The 1965 based Chart 72-1 in Appendix A, Project Maps, should be updated. This straight outer channel design, that I support for navigation safety, is in our records of the original channel construction work. The channel is now 200' wide at the jetties. The "settling basin" is inside the weir design of the north jetty. The swing bridge at state road A-1-A was replaced many years ago by a hydraulic bridge that lifts from the south side.

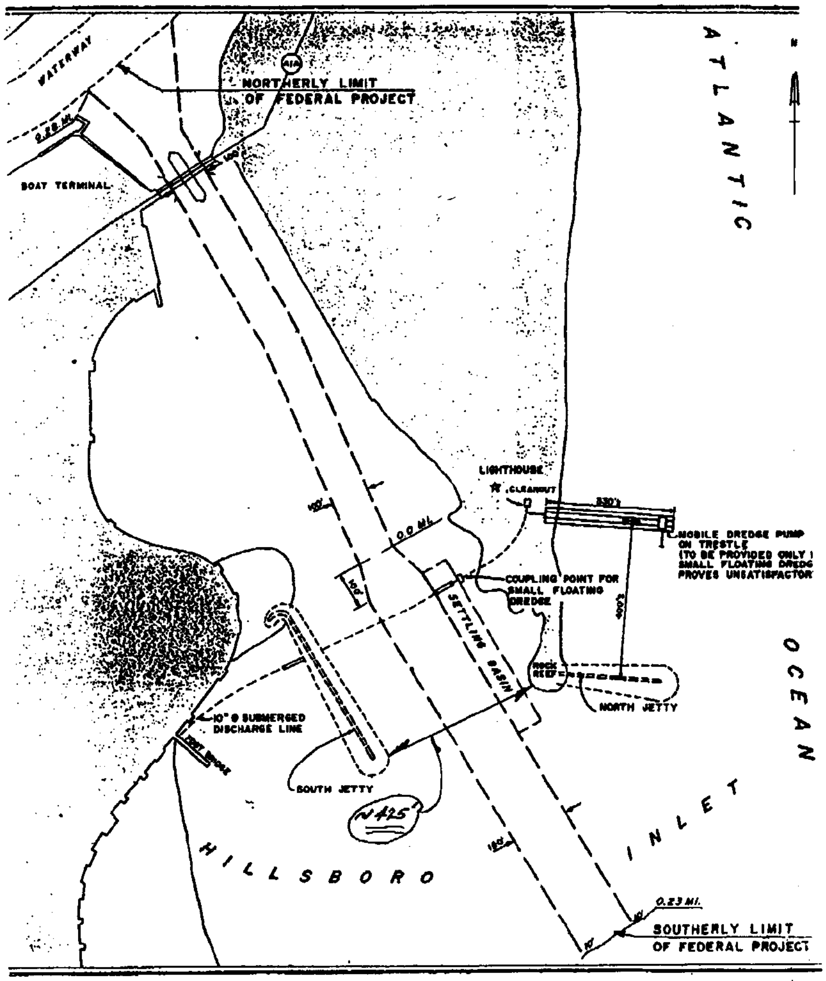
The "mobile dredge pump on trestle" and jetty extension on the north side are not needed. The channel is well maintained by the dredge, elbow barge, and floating dredge pipe we now use. The newer south jetty is about 350' from the rock reef north jetty of the channel. The inside channel bend was straightened and is maintained as a straight channel, due to the strong tidal currents.

I was favorably impressed by the assignment of an ACOE project manager to the Hillsboro Project, and the visit by 4 ACOE engineers during the first week of July. It appears there are now prospects of improving our navigation problems. I look forward to seeing you at the next Beaches & Shores seminar.

Very truly yours,

Frank

Frank Rysavy, Chairman



SIDE 1 ACOE CHART 72-1

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
SOUTHEAST/CARIBBEAN
Richard B. Russell Federal Building
75 Spring Street, S.W.
Atlanta, Georgia 30303-3388

August 14, 1996

Mr. A. J. Salem, Chief, Planning Division
Environmental Branch
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Salem:

This refers to your memorandum dated August 1, 1996, transmitting the Draft Feasibility Report and Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III.

Our review indicates there will be no significant adverse impact on any HUD programs as a result of this project.

Thank you for the opportunity to review and comment on your proposed project.

Sincerely,

Thomas A. Ficht
Supervisory Environmental Officer

August 28, 1996

Planning Division
Environmental Branch

Mr. David Ferrell
U.S. Fish and Wildlife Service
Post Office Box 2676
Vero Beach, Florida 32961-2676

Dear Mr. Ferrell:

I am responding to your telephone conversations with Kenneth Dugger of my staff in August 1996, concerning the Draft Feasibility Report on the Coast of Florida Erosion and Storm Effects Study, Region III (COF). You had some questions concerning the description of the proposed action in the Draft Environmental Impact Statement (DEIS) and what Federal action should be addressed in the Fish and Wildlife Coordination Act Report (CAR) and the Endangered Species Act (ESA) consultation.

One of your concerns is the apparent contradiction between the proposed federal action as stated in the DEIS and previous descriptions of the project in the Biological Assessment we sent you on October 5, 1995, and the Scope of Work sent you on September 12, 1995, requesting a CAR.

While the DEIS indicates that the report would only recommend a new project segment at Dania and sand transfer plants at Lake Worth and South Lake Worth Inlets, it should be noted that the DEIS addresses in some detail a number of other National Economic Development projects which have a potential for Federal authorization.

Please note that the COF study and DEIS are largely programmatic in nature. While only three actions are currently recommended for Federal participation, other actions may be tiered off this study and DEIS.

In view of the above, I request that the ESA consultation include not only the three recommended actions but also evaluate the other actions identified in our Biological Assessment and DEIS as potential "future activities." As discussed, you are currently completing the ESA consultation and this approach appears consistent with part 4.7(C) on programmatic review and part 4.4(B) on incremental steps in the *Draft Endangered Species Consultation Handbook* published by your agency in November 1994.

In a letter dated June 21, 1996, we provided the results of additional field investigations and requested that the CAR be conducted for submittal with our final report in accordance with the amended scope of work proposed in that letter. In the August 26 telephone conversation, you indicated that a new CAR and the amended scope of work are not necessary. It would be more appropriate to provide a letter of clarification rather than a new CAR. If you pursue a letter of clarification, we request that it include the following:

a. The CAR of September 30, 1994, along with your letter of clarification, constitutes the final "2(b)" report for those actions which you have sufficient information (i.e., sand transfer plants).

b. The CAR of September 30, 1994, along with your letter of clarification, also addresses all other actions in the amended scope of work and the DEIS.

c. The CAR of September 30, 1994, along with your letter of clarification, identifies the "coordination necessary during design, construction, and/or operation to fulfill the requirements of Section 2(b)" <u>after submittal of the final feasibility report</u>.

d. The CAR of September 30, 1994, along with your letter of clarification, <u>is sufficient for submittal with the Corps Final Feasibility Report in accordance with policy and guidance of the U.S. Fish and Wildlife Service</u>.

As discussed in telephone conversation, this approach appears consistent with Chapter 3, part D of *Policy and Guidance on Fulfillment of Fish and Wildlife Coordination Act Responsibilities in the Corps of Engineers Water Resource Development Program* published by your regional office in July 1986.

Thank you for working with my staff on this matter. We are looking forward to receiving the ESA consultation and the letter of clarification on the CAR. If you have any questions, please contact Mr. Kenneth Dugger of my staff at 904-232-1686.

Sincerely,

George M. Strain
Acting Chief, Planning Division

Copy Furnished:

Craig Johnson, U.S. Fish and Wildlife Service,
Post Office Box 2676, Vero Beach, Florida 32961-2676

bcc:
CESAJ-DP-I (Stevens)
CESAJ-PD-PC

Dupes/CESAJ-PD-ER/1689/mw
Dugger/CESAJ-PD-ER
[illegible]/CESAJ-PD-E
Strain/CESAJ-PD-P
Stevens/CESAJ-DP-I
Salem/CESAJ-PD

(B) Incremental steps

When a statute authorizes an agency to complete an action in incremental steps, the Services shall, at the request of the action agency, issue a biological opinion on the incremental step being considered. That opinion also includes the Services' views on the entire action (50 CFR §402.14(k)). An action agency may proceed with the proposed action after consultation, when:

- o the biological opinion does not conclude that the incremental step would violate section 7(a)(2);
- o the agency continues consultation with respect to the entire action, and obtains biological opinions, as required, for incremental steps;
- o the action agency fulfills its continuing obligation to obtain sufficient data upon which to base the final biological opinion on the entire action;
- o the incremental step does not violate section 7(d) concerning irreversible or irretrievable commitment of resources; and
- o there is a reasonable likelihood that the entire action will not violate section 7(a)(2) of ESA.

Consultation for the first phase of an incremental step action must be conducted formally to address these five factors. If no adverse effect is likely for intermediate steps, consultation may be conducted informally for such steps.

Water quality consultations

This section is reserved pending ongoing negotiations on consultation procedures for this EPA program.

Other national consultations

In the future, several other programs will probably generate national consultation requests. For example, State programs to assume administration of section 404 of the Clean Water Act may require a programmatic conservation review and/or development of specific national consultation procedures.

(C) Regional or Ecosystem Consultations

Action agencies occasionally request multi-action and "ecosystem-based" consultations. These consultations may be step-downs of conservation reviews or national consultations. In these instances, a lead Region or field office may be designated. Regional and ecosystem biological opinions may be signed at the Service's Regional Office or State Office level, as appropriate. Examples of these consultations include:

Regional:

- o APHIS' program to eradicate the boll weevil in southern cotton growing states, to control grasshoppers and crickets in western states, or to control Mediterranean fruit flies in the Southwest.

Ecosystem:

- o A Region 6-led consultation on the continuing operations of all Corps dams on the Missouri River and their effects on listed species within that aquatic ecosystem (bald eagle, piping plovers, Interior least terns and the pallid sturgeon).
- o A Region 3 consultation on operation of Corps facilities along the breadth of the Upper Mississippi River.
- o A Region 2-led consultation with the Bureau of Reclamation on regulations to implement water entitlements on the Lower Colorado River.
- o A Region 1-led consultation with the BLM on grazing activities throughout the range of the desert tortoise, and other program activities within the proposed critical habitat.

Consideration should be given to conducting ecosystem-based consultations, particularly in areas undergoing large HCPs, with the Federal agencies whose future activities may affect one or more species within a regional planning area. This type of consultation would involve programmatic review of the agencies' activities and would be most effective if conducted simultaneously with development of the HCP. Such an approach could involve a single lead agency, if there is a predominant Federal agency influence (e.g., the Bureau of Reclamation in the Central Valley of California), or could involve a limited number of agencies representing Federal programs in the planning area. Such simultaneous consideration of both Federal and nonFederal programs could (1) assist in assessing overall effects on a species/group of species/ecosystem from multiple actions; (2) result in a better determination of the respective roles of all the parties in conserving the species/ecosystem, (3) assist in determining the priority of all proposed actions for use of any "resource cushion" that may exist, and (4) demonstrate that all parties are being provided equal consideration at equal speed (programmatic consultations do not have applicants and are subject to mutually agreed timeframes).

The Region 2 consultation on the Lower Colorado may be conducted along with an HCP proposed to cover nonFederal activities and candidate species.

D. <u>When FWCA Responsibilities Cannot Be Fulfilled in the "2(b) Report."</u> The procedures for fulfilling Service responsibilities in the Corps planning process as described thus far assume that normal, established planning procedures that provide for adequate FWCA coordination are followed and that timely and sufficient project design data are available and provided to the Service prior to preparation of the 2(b) Report. Under these conditions, the Service is able to fulfill the requirements of Section 2(b) by providing a report which provides 1) clear documentation of the proposed project's impacts on fish and wildlife resources and 2) specific recommendations as to the measures that should be taken to conserve those resources.

In reality, any number of problems may arise during a given study which make it impossible for the Service to fully meet the two basic requirements of Section 2(b) in what would otherwise be the 2(b) Report. These problems may stem from insufficient or untimely data resulting from "preventable" coordination problems such as inadequate transfer funds or the Corps not providing available information on a timely basis; or they may also occur as a result of the "unpreventable" situation in which the Corps cannot provide information necessary to assess impacts until the actual design of the project begins.

Due to the uniqueness of each study or project, specific "procedures" for handling each potential problem cannot be established. Still, a general policy is needed to assure consistent and appropriate Service action when, through circumstances beyond our control, we are unable at the time of submitting the 2(b) Report to fulfill the basic requirements of Section 2(b).

This policy is that <u>the Service will not provide a report that fulfills the statutory requirements of Section 2(b) unless and until adequate data are available to 1) determine the impacts of the proposed project on fish and wildlife resources and 2) make specific recommendations as to measures that should be taken to conserve those resources.</u> Whether the lack of adequate data results from insufficient coordination or from the Corps' inability to provide necessary design data, the Service will provide a report to accompany the Corps report. However, this Service report will contain the following information.

1. The report will clearly state that it is presented in <u>partial</u> fulfillment of the FWCA and does not constitute the final report of the Secretary of Interior as required by Section 2(b) of the FWCA.

2. The reasons that the report does not constitute the final 2(b) Report will be clearly presented and documented. This requirement makes it essential that the ES Field Office officially document coordination problems as they occur.

3. The remaining coordination necessary to fully comply with the FWCA will be identified as clearly and specifically as possible.

While the reasons behind the Service's inability to fulfill Section 2(b) requirements do not affect the above policy, they could very well affect the Service's recommendations and position as presented in the report. If inadequate coordination resulting in insufficient or untimely data is the reason the 2(b) Report cannot be provided, the Service may take the position that the Corps report not be submitted for project authorization or that further Corps study not be initiated until the necessary data are provided and the 2(b) Report submitted. On the other hand, the Service may not oppose authorization and/or further study if provisions for completion of needed FWCA coordination are recommended in the Corps report. Such a position may be particularly appropriate when adequate project data cannot be provided prior to detailed design studies. In this regard, it is not uncommon for substantive impacts to hinge on design issues or construction techniques and thus impacts cannot be assessed or recommendations made at the time of report submittal. In these situations it is essential that our report define the coordination necessary during design, construction, and/or operation and state that the requirements of Section 2(b) will not be fulfilled until this coordination is completed.

This policy recognizes that Section 2(b) requires not simply a report, but rather surveys and recommendations "for the purpose of determining the possible damage to wildlife resources and for the purpose of determining means and measures that should be adopted to prevent the loss of or damage to such wildlife resources." If these tasks cannot be completely fulfilled at the time the report is submitted, they must be completed during ensuing coordination.

JUN 2 1 1996

Planning Division
Environmental Branch

Mr. Craig Johnson
U.S. Fish and Wildlife Service
P.O. Box 2676
Vero Beach, Florida 32961-2676

Dear Mr. Johnson:

I am forwarding the results of the field investigations for the Coast of Florida Erosion and Storm Effects Study, Region III. Since your office indicated they were unable to perform the field work under the Scope of Work submitted by facsimile to your office on August 3, 1995, I am also enclosing an amended Scope of Work.

I understand that your staff is concerned that the spacing of transects is greater than that normally used to support a Coordination Act Report (CAR) for shore protection activities. However, I believe a more detailed field investigation is both impracticable and unnecessary at this time. The enclosed field investigation of the approximate 90 miles of coastal area involved 22 transects and was performed by a contractor at a cost of over $55,000. It is uncertain at this time whether the final feasibility report will recommend any Federal participation or when aspects of the project would be constructed.

I request that the CAR address the likely range of impacts based on the information provided and the several CARs already conducted by your office for shore protection in Dade, Broward, and Palm Beach Counties. It appears that such a report could satisfy the requirements of Section 2(b) of the Fish and Wildlife Coordination Act by providing your recommendations (as specific as is practicable) with respect to 1) possible damage to wildlife resources, 2) means and measures that should be adopted to prevent the loss of or damage to such resources, and 3) features recommended for wildlife conservation and development. I request that, if needed, a more specific determination of resources and impacts be deferred until a particular phase or aspect of the project is more definitely considered for construction and Federal participation.

Please sign the enclosed amended Scope of Work and return it by mail and facsimile (904-232-3442) so we can fund the report. It is very important that you provide the requested CAR by July 15, 1996. Please contact me if this is not feasible.

Sincerely,

A. J. Salem
Chief, Planning Division

SCOPE OF WORK
FISH AND WILDLIFE COORDINATION ACT
COAST OF FLORIDA EROSION AND
STORM EFFECTS STUDY

REGION III

1.0 Project Title: Coast of Florida Erosion and Storm Effects Study - Region III.

2.0 Authorization Status: General Investigation, Feasibility Study.

3.0 Project Description: The Coast of Florida Study (COFS) is a multi-year, phased regional feasibility examining the entire developed east coast ocean shoreline and west coast gulf shoreline. The objective of the study is to develop a comprehensive understanding of the coastal processes and associated environmental resources to help in the development of enhanced shore protection projects while reducing environmental impacts. The current region being studied (Region III), which includes Dade, Broward and Palm Beach Counties, is nearing completion. Alternative recommendations for 21 project segment modifications have been identified through the COFS. These modifications include initial beach restoration for four new sites, (Fort Lauderdale, Highland Beach, Dania and Golden Beach) and improvements at two existing sand transfer plants (Lake Worth Inlet and South Lake Worth Inlet) in addition to modifications at other existing authorized beach nourishment sites. New nearshore berm disposal sites have also been identified as project components adjacent to several project locations. The location of identified hardground areas have been taken into consideration by scaling back recommended project footprints and carefully locating nearshore berms to reduce and/or avoid associated impacts to hardground resources. The recommended plans are discussed in the Draft Feasibility Report for the study, dated May 1995. A preliminary review copy of this report, which includes a Draft Environmental Impact Statement has been provided to the U.S. Fish and Wildlife Service Field Office in Vero Beach, Florida.

An Environmental Impact Statement (EIS) is being prepared to address the environmental impacts of the study alternatives and the selected plan. Detailed plans for some of the more complex proposed projects will not be developed during this feasibility phase. For instance, the exact location and detailed design of sand transfer plants will not be known. The general location of new sand sources have been identified during the feasibility phase; however, detailed design and analysis will take place during post authorization planning, engineering and design (PED) activities for each project. Sufficient uncertainty may exist concerning impacts to fish and wildlife resources that further environmental investigation and analyses may be needed during PED for each project. This would include endangered species coordination, and the appropriate NEPA document and coordination. More detailed investigations by the FWS would take place as needed at that time.

4.0 Work Required of the Fish and Wildlife Service (FWS):

4.1 Review of Literature and Existing Data: ....1 biologist, 10 days

Perform a review of the literature and existing data relevant to the Coast of Florida Study. This review should include, but not be limited to: 1) previous Planning Aid Reports and Coordination Act Reports prepared by the FWS for beach nourishment projects within the Region III study area, 2) existing Inlet Management Plans for inlets within the study area, 3) any information and/or data Dade, Broward, and Palm Beach Counties may have on fish and wildlife resources within the study area, 4) report entitled, Hardground and Seagrass Assessment, Coast of Florida Erosion and Storm Effects Study, Dade, Broward, and Palm Beach Counties, prepared by Lotspeich and Associates, Inc., for the Corps of Engineers.

4.2 Coordination Act Report (CAR):

Prepare and Coordinate Draft CAR ....1 biologist, 10 days

Review comments to Draft CAR and prepare Final CAR............1 biologist, 3 days

Prepare a Coordination Act Report in accordance with the Fish and Wildlife Coordination Act that will satisfy Section 2(b) of the Act. The CAR shall include:

a. Determine and evaluate the effects of potential increases in siltation and sedimentation as a result of the proposed project on nearby natural habitats.

b. Discuss alternative to minimize or avoid significant impacts to natural resources. Recommendations to mitigate possible impacts.

c. Include copies of all correspondence pertaining to the FWCA studies and report.

4.3 Report submittal:

a. A draft CAR shall be submitted to the Corps by July 15, 1996.

b. A final CAR shall be submitted to the Corps within 45 days after submittal of the draft CAR.

5.0 Information to be provided by the Corps: Provide a copy of the report entitled, Hardground and Seagrass Assessment, Coast of Florida Erosion and Storm Effects Study, Dade, Broward, and Palm Beach Counties, prepared by Lotspeich and Associates, Inc

6.0 Agreement:

By completion of the enclosed DD Form 448, transferring funds for this work in accordance with the enclosed itemized cost estimate, the undersigned certify intention to perform respective tasks within the time frames stated in this Scope of Work.

CRAIG JOHNSON	HANLEY K. SMITH
Field Supervisor	Chief, Environmental Branch
U.S. Fish and Wildlife Service	U.S. Army Corps of Engineers
DATE:______________	DATE:______________

Dated: August 12, 1996.
H. Roger Frauenfelder,
General Manager.
[FR Doc. 96–21576 Filed 8–22–96; 8:45 am]
BILLING CODE 6450-01-P

[FRL–5559–3]

Acid Rain Program: Notice of State Acid Rain Programs

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: Title IV of the Clean Air Act requires EPA to establish the Acid Rain Program to reduce the adverse environmental and public health effects of acidic deposition. Under titles IV and V of the Act, State and local air permitting authorities develop and administer acid rain programs as part of their title V operating permits programs. The State and local permitting authorities listed in this notice have recently submitted acid rain programs for EPA review that have subsequently been determined to be acceptable to the EPA Administrator as part of their title V operating permits programs. EPA has previously published in the Federal Register lists of other State and local permitting authorities with acceptable acid rain programs; see 60 FR 16127 (March 29, 1995) and 60 FR 52911(October 11, 1995). This notice is for informational purposes only and does not supplant any other Federal Register notices under title V.

FOR FURTHER INFORMATION CONTACT: Robert Miller, U.S. EPA, Acid Rain Division (6204J), 401 M St., SW., Washington, DC 20460, (202) 233–9077.

SUPPLEMENTARY INFORMATION: In Phase I of the Acid Rain Program (1995 through 1999), EPA issues Phase I acid rain permits and is the permitting authority for certain acid rain affected sources. In Phase II of the Acid Rain Program (beginning in the year 2000 and continuing into perpetuity), State and local permitting authorities are required under titles IV and V of the Act to act as the permitting authority for acid rain affected sources in Phase II and issue acid rain permits as part of their title V operating permits programs. Initial Phase II acid rain permits must be issued to all acid rain affected sources no later than December 31, 1997.

The following State and local permitting authorities have submitted acid rain programs that are acceptable to the EPA Administrator as part of their title V operating permits programs:

Region 1

The Department of Environmental Protection, Bureau of Air Management, in the State of Connecticut;

The Department of Environmental Protection, Bureau of Air Quality Control, in the State of Maine;

The Department of Environmental Services, in the State of New Hampshire.

Region 2

The Department of Environmental Conservation, in the State of New York.

Region 3

The Division of Environmental Protection, in the State of West Virginia.

Region 4

The Department of Natural Resources and Environmental Management, in the City of Huntsville, Alabama;

The Jefferson County Department of Health, in the State of Alabama;

The Department of Environmental Quality, in the State of Mississippi;

The Department of Environment, Health, and Natural Resources, in the State of North Carolina.

Region 6

The Air Pollution Control Division, in the City of Albuquerque, New Mexico.

Region 8

The Department of Health and Environmental Sciences, Air Quality Division, in the State of Montana.

Region 9

The Pima County Department of Environmental Quality, in the State of Arizona;

The Sacramento Metropolitan Air Quality Management District, in the State of California.

Dated: August 15, 1996.
Brian J. McLean,
Director, Acid Rain Division, Office of Atmospheric Programs, Office of Air and Radiation.
[FR Doc. 96–21574 Filed 8–22–96; 8:45 am]
BILLING CODE 6560-50-P

[FRL–5558–4]

Proposed Settlement; Hazardous Organic NESHAP Litigation

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of Proposed Settlement; Request for Public Comment.

SUMMARY: In accordance with Section 113(g) of the Clean Air Act ("Act"), notice is hereby given of a proposed settlement of the following cases: *Chemical Manufacturers Association* v. *U.S. EPA*, Nos. 94–1463 and 94–1465 (D.C. Cir.).

These consolidated cases, filed by the Chemical Manufacturers Association and the Dow Chemical Company, involve challenges to the Hazardous Organic National Emission Standard (NESHAP) promulgated by EPA under section 112(d) of the Clean Air Act for the synthetic organic chemical manufacturing industry. See 59 FR 19402 (April 22, 1994). (Codified at 40 CFR part 63, subparts F, G, H and I).

For a period of thirty (30) days following the date of publication of this notice, the Agency will receive written comments relating to the settlement from persons who were not named as parties to the litigation in question. EPA or the Department of Justice may withhold or withdraw consent to the proposed settlement if the comments disclose facts or circumstances that indicate that such consent is inappropriate, improper, inadequate, or inconsistent with the requirements of the Act.

A copy of the settlement has been lodged with the Clerk of the United States Court of Appeals for the District of Columbia Circuit. Copies of the settlement are also available from Jacqueline Jordan, Air and Radiation Division (2344), Office of General Counsel, U.S. Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460, (202) 260–7622. Written comments should be sent to Patricia Embrey, at the above address and must be submitted on or before September 23, 1996.

Dated: August 13, 1996.
Scott C. Fulton,
Acting General Counsel.
[FR Doc. 96–21577 Filed 8–22–96; 8:45 am]
BILLING CODE 6560-50-M

[ER–FRL–5272–5]

Environmental Impact Statements; Notice of Availability

RESPONSIBLE AGENCY: Office of Federal Activities, General Information (202) 564–7167 OR (202) 564–7153. Weekly receipt of Environmental Impact Statements Filed August 12, 1996 Through August 16, 1996 Pursuant to 40 CFR 1506.9

EIS No. 960381, Draft EIS, COE, FL, Coast of Florida Erosion and Storm Effects Study Region III, Construction, Operation and Maintenance, Shore Protection Project, Palm Beach, Broward and Dade Counties, FL, Due:

October 07, 1996, Contact: Michael Dupes (904) 232–1689.

EIS No. 960382, Draft EIS, AFS, ID, WA, Priest Lake Ranger District Noxious Weed Control Project, Implementation, Idaho Panhandle National Forest, Bonner County, ID and Pend Oreille County, WA, Due: October 07, 1996, Contact: Tim Layser (208) 443–2512.

EIS No. 960383, Draft EIS, AFS, ID, St. Joe Noxious Weed Control Project, Implementation, St. Maries River, St. Joe River and Little North Fork Clearwater River, Benewah, Shoshone and Latah Counties, ID, Due: October 07, 1996, Contact: Mary Laws (208) 245–4517.

EIS No. 960384, Draft Supplement, AFS, VA, George Washington National Forest, Revised Land and Resource Management Plan, Concerning Oil and Gas Leasing in Laurel Fork Special Management Area, Highland County, VA, Due: October 07, 1996, Contact: Dave Plunkett (540) 564–8300.

EIS No. 960385, Draft EIS, IBR, CA, Interim South Delta Program (ISDP), Construction and Operation, Sacramento/San Joaquin Delta, Implementation, COE Section 404 Permit, Alameda, Contra Costa and San Joaquin Counties, CA, Due: December 06, 1996, Contact: Alan R. Candlish (916) 989–7255.

EIS No. 960386, Draft EIS, DOE, ID, NV, WA, MT, OR, WY, Wildlife Mitigation Program Standards and Guidelines, Implementation, Columbia River Basin, WA, OR, ID, MT, UT, WY and NV, Due: October 07, 1996, Contact: Thomas C. McKinney (503) 230–4749.

EIS No. 960387, Final EIS, FTA, IL, St. Clair County Corridor Transit Improvements, Funding, St. Clair County, IL, Due: September 23, 1996, Contact: Joni Roeseter (816) 523–0204.

EIS No. 960388, Draft EIS, BLM, NM, Little Rock Open-Pit Mine Project, Construction and Operation, Plan of Operations Approval, and several Permits Issuance, Grant County, NM, Due: October 15, 1996, Contact: Juan Padilla (505) 525–4376.

EIS No. 960389, Final EIS, FHW, PA, Danville-Riverside Bridge Replacement Project, Construction and Road Construction, across the North Branch of the Susquehanna River, Funding and Section 404 Permit, Appalachian Mountain, Montour and Northumberland Counties, PA, Due: September 23, 1996, Contact: Manuel A. Marks (717) 782–3461.

EIS No. 960390, Final EIS, NOA, TX, Texas Combined Coastal Management Program, Implementation, Federal Approval, Gulf of Mexico, TX, Due: September 23, 1996, Contact: Bill O'Beirne (301) 713–3109.

EIS No. 960391, Draft EIS, GSA, GA, Clifton Road Campus of the Centers for Disease Control and Prevention Acquisition of Additional Property, DeKalb County, GA, Due: October 07, 1996, Contact: Phil Youngberg (404) 331–1831.

EIS No. 960392, Final EIS, FHW, CO, Parker Road (CO–83)/I–225 Interchange Project (FCU–CX–083–1) (49), Improvement between Peoria Street to Hampden Avenue, Funding, NPDES Permit and COE Section 404 Permit, City of Aurora, Arapahoe County, CO, Due: September 23, 1996, Contact: George H. Osborne (303) 969–6730.

EIS No. 960393, Final EIS, COE, NC, Texasgulf Open Pit Mine Continuation, Construction and Operation, Permit Approval, Pamlico River, Aurora, Beaufort County, NC, Due: September 23, 1996, Contact: Hugh Heine (910) 251–4070.

Amended Notices

EIS No. 960364, Draft EIS, AFS, MT, Lewis and Clark National Forest Plan, Implementation, Oil and Gas Leasing Analysis, Upper Missouri River Basin, several counties, MT, Due: November 08, 1996, Contact: Robin Strathy (406) 791–7726.

Published FR—08–9–96—Due Date Correction.

Dated: August 20, 1996.

William D. Dickerson,

Director, NEPA Compliance Division, Office of Federal Activities.

[FR Doc. 96–21569 Filed 8–22–96; 8:45 am]

BILLING CODE 6560–50–U

[FRL–5559–4]

Public Meeting of the Sanitary Sewer Overflow Advisory Subcommittee

AGENCY: Environmental Protection Agency.

ACTION: Notice.

SUMMARY: Notice is hereby given that the Environmental Protection Agency (EPA) is convening a public meeting on September 9–10, 1996. This meeting is open to the public without need for advance registration. The Sanitary Sewer Overflows (SSO) Advisory Subcommittee will discuss identification of approaches for key issues and the overall SSO strategy.

DATES: The SSO meeting will be held on September 9–10, 1996. The September 9 meeting will begin promptly at 10:00 a.m. EST and end at approximately 5:00 p.m. On September 10, the meeting will begin at 8:30 a.m. and end at approximately 4:00 p.m.

ADDRESSES: The meeting will be held at the Holiday Inn Historic-District, 625 First Street, Alexandria, Virginia. The Holiday Inn's telephone number is (703) 548–6300.

FOR FURTHER INFORMATION: Contact Charles Vanderlyn, Office of Wastewater Management, at (202) 260–7277.

Dated: August 9, 1996.

Michael B. Cook,

Director, Office of Wastewater Management, Designated Federal Official.

[FR Doc. 96–21575 Filed 8–22–96; 8:45 am]

BILLING CODE 6560–50–P

[FRL–5559–7]

Science Advisory Board; Notification of Public Advisory Committee Meetings; Open Meetings

Pursuant to the Federal Advisory Committee Act, Public Law 92–463, notice is hereby given that several committees of the Science Advisory Board (SAB) will meet on the dates and times described below. All times noted are Eastern Time. All meetings are open to the public. Due to limited space, seating at meetings will be on a first-come basis. For further information concerning specific meetings, please contact the individuals listed below. Documents that are the subject of SAB reviews are normally available from the originating EPA office and are not available from the SAB Office.

1. Executive Committee

The Executive Committee of the EPA Science Advisory Board will meet on Tuesday and Wednesday, September 17–18, 1996. The meeting will convene at 8:30 a.m. in the Administrator's Conference Room 1103—West Tower of the U.S. Environmental Protection Agency Headquarters Building at 401 M Street SW, Washington, DC 20460, and adjourn no later than 5:30 p.m. The meeting is open to the public, however, seating is limited and available on a first come basis.

At this meeting, the Executive Committee will receive updates from its committees and subcommittees concerning their recent and planned activities. As part of these updates, some committees will present draft reports for Executive Committee review and approval. Expected drafts include:

1. Executive Committee's "Lookout Panel" Committee-of-the-Whole activity; Commentary on the First Lookout Panel Session: Forecasting Future Water Environmental Issues.

August 2, 1996

Planning Division
Environmental Branch

Mr. Chris Marhenki
Broward County Main Library
Government Documents Department
100 South Andrews Avenue
Ft. Lauderdale, Florida 33301

Dear Mr. Marhenki:

As discussed with Mike Dupes of my staff, enclosed is a copy of the Feasibility Report and Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III. The report is in three volumes and is being provided to allow for public review. Please make them available in the reference section of your library.

Thank you for your assistance in this matter. If you have any questions or need any additional information, please contact Mr. Dupes at 904-232-1689.

Sincerely,

George M. Strain
~~A. J. Salem~~
Acting Chief, Planning Division

Enclosure

August 2, 1996

Planning Division
Environmental Branch

Ms. Cathy Benson
Palm Beach County Central Library
3650 Summit Boulevard
West Palm Beach, Florida 33406

Dear Ms. Benson:

As discussed with Mike Dupes of my staff, enclosed is a copy of the Feasibility Report and Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III. The report is in three volumes and is being provided to allow for public review. Please make them available in the reference section of your library.

Thank you for your assistance in this matter. If you have any questions or need any additional information, please contact Mr. Dupes at 904-232-1689.

Sincerely,

George M. Strain
~~A. J. Salem~~
Acting Chief, Planning Division

Enclosure

August 2, 1996

Planning Division
Environmental Branch

Ms. Gia Thompson
Miami Beach Branch Library
2100 Collins Avenue
Miami Beach, Florida 33139

Dear Ms. Thompson:

As discussed with Mike Dupes of my staff, enclosed is a copy of the Feasibility Report and Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III. The report is in three volumes and is being provided to allow for public review. Please make them available in the reference section of your library.

Thank you for your assistance in this matter. If you have any questions or need any additional information, please contact Mr. Dupes at 904-232-1689.

Sincerely,

George M. Strain
Acting Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

August 2, 1996

REPLY TO
ATTENTION OF
Planning Division
Environmental Branch

TO WHOM IT MAY CONCERN:

Pursuant to the National Environmental Policy Act and U.S. Army Corps of Engineers Regulation (33 CFR 230.11), this letter constitutes the Notice of Availability of the Draft Feasibility Report and Draft Environmental Impact Statement (DEIS) for the Coast of Florida Erosion and Storm Effects Study, Region III. A summary of the DEIS is provided as enclosure 1.

Copies of the Feasibility Report and DEIS will be provided at a reasonable cost of reproduction. Requests for copies should be directed to Mr. Kenneth Dugger, Chief, Environmental Coordination Section at the letterhead address or 904-232-1686 or fax 904-232-3442. Copies of the report and DEIS will be available for public review at the locations shown on enclosure 2.

Sincerely,

A. J. Salem
Chief, Planning Division

Enclosure

DRAFT ENVIRONMENTAL IMPACT STATEMENT

COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY, REGION III, PALM BEACH, BROWARD, AND DADE COUNTIES, FLORIDA

1.0 SUMMARY

1.1 Major Conclusions

Beaches along the Region III shoreline are in differing stages of erosion that require specific plans of action to reestablish beaches and protect them from storm damages. To economize in the planning and implementation of these projects, they have been aggregated into a regional plan that is presently analyzed in reference with the no-action alternative, which assumes that no nourishment operations would be completed outside of those already funded and in operation. The currently proposed combination of alternatives (recommended plan) involves several types of actions including beach nourishments, nearshore berm placements, and sand transfer plants. These projects have the collective goal of reestablishing the beaches that have been degraded through anthropogenically disturbed littoral movement and storm damage.

The recommended plan would generally have only temporary impacts due to the nature of the activities. However, some impacts would have more enduring effects than others. Water turbidity in the vicinity of operations would generally increase during the borrow and nourishment activities; however, these impacts would be temporary and insignificant. Some turbidity associated impacts to hardgrounds near borrow areas may also occur, but mitigation efforts, namely buffer zones, should minimize these effects. Nourishment activities would avoid sensitive turtle nesting windows as well as be operated per the prescribed constraints of the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS); thus, impacts to sea turtles should be minimal and within allowable "taking" levels. An estimated 100, 91, and 24 acres of new beach would be created in Palm Beach, Broward, and Dade counties, respectively, which could benefit nesting sea turtles. Borrow operations would be conducted according to NMFS guidelines, minimizing the potential for takes of sea turtles in the borrow site area. Impacts to the endangered Indian manatee would likewise be minimal, with the implementation of operational requirements dictated by the USFWS. It is unlikely that other endangered species would be significantly impacted in an adverse manner from borrow or nourishment operations.

Preliminary estimates suggest that approximately 31, 25, and 5 acres of hardgrounds, in Palm Beach, Broward, and Dade counties, respectively, would be buried or otherwise impacted from nourishment activities associated with the recommended plan. However, mitigation measures would negate any habitat losses realized from hardground coverage associated with nourishment activities. Mechanical damage to hardgrounds is possible with borrow operations, although unlikely with the use of buffer zones and state-of-the-art navigation and positioning equipment. Temporary impacts associated with turbidity and sedimentation are likely in hardground areas flanking borrow sites, although efforts to minimize these impacts will be made through the establishment of buffer zones and other measures.

Direct effects on the regional economy from the implementation of proposed combination of alternatives (borrow, nourishment, or other associated activities) should be minor; however, projected 10- and 20-year storm damages as great as $33 million could be avoided. Cultural resources should not be affected by the proposed action; however, in the event that underwater archaeological remains are discovered during operations, appropriate action will be taken to minimize disturbance and insure integrity of the finding. Recreational resources should generally benefit with greater beach widths for beach activities. An estimated 100, 91, and 24 acres of additional beach would be created in Palm Beach, Broward, and Dade counties, respectively under the recommended plan. Benefits from this additional beach have been estimated to have an average annual equivalent recreational benefit as great as a $8.7 million in Region III. However, increased turbidity levels may temporarily affect some hardground areas presently used by recreational divers. Long-term coverage of some hardground areas would be replaced with other habitat areas that could also be used by divers after colonization.

1.2 Areas of Controversy

Several areas of controversy exist for the COFS project. These are discussed below:

Use of Bahamian Sand for Nourishment Activities in Broward and Dade Counties. Bahamian sand has been proposed as a compatible nourishment sand for beaches in Broward and Dade counties. Only one nourishment project to date has been studied (Fisher Island renourishment, Lutz *et al.*, 1993), and some entities believe that the lighter color of the sand that yields slightly cooler temperatures in sea turtle nests could lead to a proportionally greater number of female hatchlings. To date, no definitive studies on this issue have been documented.

Impacts on Sea Turtles. In addition to the issues surrounding the use of Bahamian sand, there is general concern that nourishment and borrow activities could lead to an unacceptable number of sea turtle "takes." This concern relates to the timing of activities, the compaction and slope of nourished beaches, and the operation plans (lighting and dredge-type) for borrow and nourishment operations. Consultation with the USFWS and the NMFS has resulted in a set of operational guidelines that will minimize "takes" of sea turtles.

Impacts on Sea Grass Beds. Although dense and relatively dense sea grass bed locations have been well mapped by the Florida Marine Research Institute (FMRI), sparse grass beds located in inlets and nearshore softbottoms are not fully mapped. There is a concern that unmapped, sparse beds near borrow or nourishment areas may be affected by increased turbidity levels and direct coverage associated with nourishment activities. Prior to borrow and nourishment activities, site reconnaissance will reveal any significant unmapped sea grass beds. Information from reconnaissance surveys will help in operational plans to avoid significant adverse impacts to these beds.

Impacts on Hardgrounds. Several concerns exist over the projected impacts to hardground areas in the nearshore and vicinity of the borrow areas. Generally, there is a concern that associated turbidity and sedimentation impacts to hardgrounds are not fully understood and that they may be understated herein. The available literature has been reviewed and suggests that although impacts are likely, they are not likely to be permanent. Furthermore, with the observance of buffer zones, associated turbidity and sedimentation, and mechanical impacts should be minimized.

1.3 Unresolved Issues

As noted in the section 1.2, Areas of Controversy, several of these controversial issues are unresolved. Specifically, impacts associated with the use of Bahamian sand are not fully documented for south Florida beaches. More specifically, the effects of Bahamian sand on sea turtle nesting are not definitively documented at this time. In addition to the unresolved concerns regarding Bahamian sand, the effects of increased turbidity and sedimentation on hardgrounds in both the nearshore and borrow areas are not fully understood. Although impacts would occur to hardgrounds from nourishment activity burial and can definitively be projected, the relationships among turbidity, sedimentation, and mortality are not definitive for all species in nearshore and borrow area hardgrounds. Therefore, although estimates of hardground impacts are provided herein, the precise amount of hardground mitigation needed for the implementation of the recommended plan is unresolved at this time.

1.4 Environmental Impact Tiering

Although location-independent and general impacts associated with the proposed action are discussed in this report, location-specific impacts with regard to borrow areas and nourishment activities are reserved for future tiered documentation (40 CFR §1508.28) that will be developed as project-specific details become available.

1.5 Department of Army Budgeting Policy

The recommendations contained within the Coast of Florida Erosion and Storm Effects Study Region III draft feasibility report reflect the information available at this time, and current Department of the Army policies and Federal law governing formulation of individual project modifications. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program, nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations for modifications to authorized storm damage reduction projects, recommendations for new storm damage reduction projects, and the recommendation for shore damage mitigation project at Palm Beach Harbor, and information in this report may be modified before it is transmitted to higher authority as proposals for project modification and/or implementation funding.

The Department of the Army Fiscal Year 1996 Civil Works allocations reflect the President's commitment to focus the development of the Nation's water resources on projects and programs which have national significance. The allocations maintain the Federal government's commitments to Non-Federal sponsors for phases of work already underway but do not include any requests for new studies, design or construction for shore protection projects. The U.S. Army Corps of Engineers may or may not be allowed to fund plans and specifications and construction for Region III shore protection projects. The Fiscal Year 1997 budgetary objectives of the Administration are under preparation, and may change as the Congress reviews the President's Fiscal Year 1997 budget requests and prepares appropriation legislation.

Copies of the Feasibility Study and Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study will be available at the following locations:

Palm Beach County Central Library
3650 Summit Boulevard
West Palm Beach, Florida 33406
Point of Contact: Ms. Cathy Benson
Phone Number: 561-233-2600
Library Hours: 10 a.m. to 9 p.m. Monday through Thursday
10 a.m. to 5 p.m. Friday and Saturday
1 p.m. to 5 p.m. Sunday

Palm Beach County Department
of Environmental Resources Management
3323 Belvedere Road, Building 502
West Palm Beach, Florida 33406
Point of Contact: Mr. Bob Clinger
Phone Number: 561-233-2433
Office Hours: 8 a.m. to 5 p.m. Monday through Friday

Broward County Main Library
Government Documents Department
100 South Andrews Avenue
Ft. Lauderdale, Florida 33301
Point of Contact: Mr. Chris Marhenki
Phone Number: 954-357-7437
Library Hours: 9 a.m. to 9 p.m. Monday through Thursday
9 a.m. to 5 p.m. Friday and Saturday
12 p.m. to 5:30 p.m. Sunday

Broward County Department of Natural Resources Protection
218 S.W. 1st Avenue
Ft. Lauderdale, Florida 33301
Point of Contact: Mr. Steve Higgins
Phone Number: 954-519-1265
Office Hours: 8 a.m. to 4:30 p.m. Monday through Friday

Enclosure 2

Miami Beach Branch Library
2100 Collins Avenue
Miami Beach, Florida 33139
Point of Contact: Ms. Gia Thompson
Phone Number: 305-535-4219
Library Hours: 10 a.m. to 8 p.m. Monday and Wednesday
10 a.m. to 5:30 p.m. Tuesday, Thursday, Friday & Saturday

Dade County Department of Environmental Resources Protection
33 S.W. 2nd Avenue, Suite 300
Miami, Florida 33130-1540
Point of Contact: Mr. Brian Flynn
Phone Number: 305-372-6850
Office Hours: 8:30 a.m. to 5 p.m. Monday through Friday

LIST OF ADDRESSEES

NOTICE OF AVAILABILITY
DRAFT ENVIRONMENTAL IMPACT STATEMENT
COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY
REGION III

FLORIDA AUDUBON SOCIETY
460 HIGHWAY 436
SUITE 200
CASSELBERRY FL 32707

FLORIDA WILDLIFE FEDERATION
PO BOX 6870
TALLAHASSEE FL 32314-6870

CARIBBEAN CONSERVATION CORP
PO BOX 2866
GAINESVILLE FL 32602

MR JOHN RAINS JR
ISAAK WALTON LEAGUE OF AMERICA INC
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SUITE 11
JACKSONVILLE FL 32216

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10900 STATE ROAD 703
NORTH PALM BEACH FL 33408

HISTORICAL SOCIETY OF PALM BEACH COUNY
105 S NARCISSUS STREET
WEST PALM BEACH FL 33401

SIERRA CLUB - LOXAHATCHEE GROUP
P O BOX 6271
LAKE WORTH FL 33461

AUDUBON SOCIETY OF THE EVERGLADES
P O BOX 16914
WEST PALM BEACH FL 33416-6914

ROYAL PALM AUDUBON SOCIETY
1300 NW 6TH STREET
BOCA RATON FL 33486

FLORIDA OCEANOGRAPHIC SOCIETY
890 N E OCEAN BOULEVARD
STUART FL 34996

FLORIDA NATIVE PLANT SOCIETY
7667 PARK LANE
LAKE WORTH FL 33467

FLORIDA MARINE CONSERVATION
CORPORATION
12295 INDIAN MOUND ROAD
LAKE WORTH FL 33467-8220

CENTER FOR MARINE CONSERVATION
ONE BEACH DRIVE SE #304
ST PETERSBURG FL 33701

FLORIDA SHORE AND BEACH
PRESERVATION ASSOCIATION
SINGER ISLAND CHAPTER
5200 N OCEAN DRIVE #1006
RIVIERA BEACH FL 33404

FLORIDA SHORE AND BEACH
PRESERVATION ASSOCIATION (FSBPA)
864 EAST PARK AVENUE
TALLAHASSEE FL 32301

JOHN SZELIGOWSKI
TAMS CONSULTANTS
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NEW YORK NY 10017

MR JOHN FLICKER
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2699 LEE ROAD #500
WINTER PARK FL 32789

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MIAMI SPRINGS FL 33166

TROPICAL AUDUBON SOCIETY
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REGIONAL DIRECTOR
THE WILDERNESS SOCIETY
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MR DONALD DUERR
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PO BOX 6032
LARAMIE WY 82070

DIRECTOR
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FORT LAUDERDALE FL 33301

MR STEVE D'OLIVERA
SUN SENTINEL
200 E LAS OLAS BOULEVARD
FORT LAUDERDALE FL 33301-2293

BROWARD REVIEW
EDITOR
P O BOX 114366
FORT LAUDERDALE FL 33302

MIAMI HERALD (BROWARD)
CITY EDITOR
4000 HOLLYWOOD BOULEVARD
SUITE 200
NORTH HOLLYWOOD FL 33021

PALM BEACH POST
EDITOR
P O BOX 24700
WEST PALM BEACH FL 33405-4700

HI-RISER
EDITOR
2000 E OAKLAND PARK BOULEVARD
SUITE 103
FORT LAUDERDALE FL 33306

DIRECTOR
PUBLIC WORKS DEPT
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1700 CONVENTION CENTER DRIVE
MIAMI BEACH FL 33149

MAYOR
CITY OF BOCA RATON
201 W PALMETTO PARK ROAD
BOCA RATON FL 33432

CITY MANAGER
CITY OF BOCA RATON
201 W PALMETTO PARK ROAD
BOCA RATON FL 33432

MAYOR
CITY OF BOYNTON BEACH
100 E BOYNTON BEACH BLVD
BOYNTON BEACH FL 33435

CITY MANAGER
CITY OF BOYNTON BEACH
100 E BOYNTON BEACH BLVD
BOYNTON BEACH FL 33435

MAYOR
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5000 N OCEAN BOULEVARD
BOYNTON BEACH FL 33435

TOWN MANAGER
TOWN OF BRINY BREEZES
5000 N OCEAN BOULEVARD
BOYNTON BEACH FL 33435

MAYOR
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100 N W FIRST AVENUE
DELRAY BEACH FL 33444

CITY MANAGER
CITY OF DELRAY BEACH
100 N W FIRST AVENUE
DELRAY BEACH FL 33444

MAYOR
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GULF STREAM FL 33483

TOWN MANAGER
TOWN OF GULF STREAM
100 SEA ROAD
GULF STREAM FL 33483

MAYOR
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3614 S OCEAN BOULEVARD
HIGHLAND BEACH FL 33487

TOWN MANAGER
TOWN OF HIGHLAND BEACH
3614 S OCEAN BOULEVARD
HIGHLAND BEACH FL 33487

MAYOR
TOWN OF JUNO BEACH
340 OCEAN DRIVE
JUNO BEACH FL 33408

TOWN MANAGER
TOWN OF JUNO BEACH
340 OCEAN DRIVE
JUNO BEACH FL 33408

MAYOR
TOWN OF JUPITER
210 MILITARY TRAIL
JUPITER FL 33458

TOWN MANAGER
TOWN OF JUPITER
210 MILITARY TRAIL
JUPITER FL 33458

MAYOR
TOWN OF JUPITER INLET COLONY
P O BOX 728
JUPITER FL 33468-0728

MAYOR
CITY OF LAKE WORTH
7 N DIXIE HIGHWAY
LAKE WORTH FL 33460

CITY MANAGER
CITY OF LAKE WORTH
7 N DIXIE HIGHWAY
LAKE WORTH FL 33460

MAYOR
TOWN OF LANTANA
500 GREYNOLDS CIRCLE
LANTANA FL 33462

TOWN MANAGER
TOWN OF LANTANA
500 GREYNOLDS CIRCLE
LANTANA FL 33462

MAYOR
TOWN OF MANALAPAN
600 S OCEAN BOULEVARD
MANALAPAN FL 33462-3321

TOWN MANAGER
TOWN OF MANALAPAN
600 S OCEAN BOULEVARD
MANALAPAN FL 33462-3321

MAYOR
VILLAGE OF NORTH PALM BEACH
501 FEDERAL HIGHWAY
NORTH PALM BEACH FL 33408

VILLAGE MANAGER
VILLAGE OF NORTH PALM BEACH
501 FEDERAL HIGHWAY
NORTH PALM BEACH FL 33408

MAYOR
TOWN OF OCEAN RIDGE
6450 N OCEAN BOULEVARD
OCEAN RIDGE FL 33435

TOWN MANAGER
TOWN OF OCEAN RIDGE
6450 N OCEAN BOULEVARD
OCEAN RIDGE FL 33435

MAYOR
TOWN OF PALM BEACH
P O BOX 2029
PALM BEACH FL 33480

TOWN MANAGER
TOWN OF PALM BEACH
P O BOX 2029
PALM BEACH FL 33480

MAYOR
TOWN OF PALM BEACH SHORES
247 EDWARDS LANE
PALM BEACH SHORES FL 33404

MAYOR
CITY OF RIVIERA BEACH
600 W BLUE HERON BOULEVARD
RIVIERA BEACH FL 33404

CITY MANAGER
CITY OF RIVIERA BEACH
600 W BLUE HERON BOULEVARD
RIVIERA BEACH FL 33404

MAYOR
TOWN OF SOUTH PALM BEACH
3577 S OCEAN BOULEVARD
SOUTH PALM BEACH FL 33480

TOWN MANAGER
TOWN OF SOUTH PALM BEACH
3577 S OCEAN BOULEVARD
SOUTH PALM BEACH FL 33480

MAYOR
VILLAGE OF TEQUESTA
P O BOX 3273
TEQUESTA FL 33469

VILLAGE MANAGER
VILLAGE OF TEQUESTA
P O BOX 3273
TEQUESTA FL 33469

CITY MANAGER
CITY OF DANIA
CITY HALL
100 W DANIA BEACH BLVD
DANIA FL 33004

MAYOR
CITY OF DANIA
CITY HALL
100 W DANIA BEACH BLVD
DANIA FL 33004

CITY MANAGER
CITY OF DEERFIELD BEACH
CITY HALL
150 N W SECOND AVENUE
DEERFIELD BEACH FL 33441

MAYOR
CITY OF DEERFIELD BEACH
CITY HALL
150 N W SECOND AVENUE
DEERFIELD BEACH FL 33441

CITY MANAGER
CITY OF FORT LAUDERDALE
CITY HALL
P O DRAWER 14250
FORT LAUDERDALE FL 33302

MAYOR
CITY OF FORT LAUDERDALE
CITY HALL
P O DRAWER 14250
FORT LAUDERDALE FL 33302

CITY MANAGER
CITY OF HALLANDALE
CITY HALL
308 S DIXIE HIGHWAY
HALLANDALE FL 33009

MAYOR
CITY OF HALLANDALE
CITY HALL
308 S DIXIE HIGHWAY
HALLANDALE FL 33009

TOWN MANAGER
TOWN OF HILLSBORO BEACH
TOWN HALL
1210 HILLSBORO BEACH
POMPANO BEACH FL 33062

MAYOR
TOWN OF HILLSBORO BEACH
TOWN HALL
1210 HILLSBORO BEACH
POMPANO BEACH FL 33062

CITY MANAGER
CITY OF HOLLYWOOD
CITY HALL
P O BOX 229045
HOLLYWOOD FL 33022-9045

MAYOR
CITY OF HOLLYWOOD
CITY HALL
P O BOX 229045
HOLLYWOOD FL 33022-9045

TOWN MANAGER
TOWN OF LAUDERDALE-BY-THE-SEA
TOWN HALL
4501 OCEAN DRIVE
LAUDERDALE-BY-THE-SEA FL 33308

MAYOR
TOWN OF LAUDERDALE-BY-THE-SEA
TOWN HALL
4501 OCEAN DRIVE
LAUDERDALE-BY-THE-SEA FL 33308

ADMINISTRATIVE ASST TO THE MAYOR
CITY OF LIGHTHOUSE POINT
CITY HALL
P O BOX 5100
LIGHTHOUSE POINT FL 33064

MAYOR
CITY OF LIGHTHOUSE POINT
CITY HALL
P O BOX 5100
LIGHTHOUSE POINT FL 33064

CITY MANAGER
CITY OF OAKLAND PARK
CITY HALL
3650 NE 12TH AVENUE
OAKLAND PARK FL 33334

CITY MANAGER
CITY OF POMPANO BEACH
CITY HALL
100 W ATLANTIC BLVD
P O DRAWER 1300
POMPANO BEACH FL 33061

MAYOR
CITY OF POMPANO BEACH
CITY HALL
100 W ATLANTIC BLVD
P O DRAWER 1300
POMPANO BEACH FL 33061

CITY MANAGER
CITY OF MIAMI BEACH
TOWN HALL
1700 CONVENTION HALL CENTER
MIAMI BEACH FL 33139

MAYOR
CITY OF MIAMI BEACH
1700 CONVENTION CENTER DRIVE
MIAMI BEACH FL 33139

CITY MANAGER
CITY HALL
6130 SUNSET DRIVE
SOUTH MIAMI FL 33143

MAYOR
CITY OF SOUTH MIAMI
6130 SUNSET DRIVE
SOUTH MIAMI FL 33143

CITY MANAGER
CITY OF MIAMI
CITY HALL
3500 PAN AMERICAN DR
MIAMI FL 33133

CITY MANAGER
CITY OF NORTH MIAMI BEACH
CITY HALL
17011 NE 19 AVENUE
NORTH MIAMI BEACH FL 33162

CITY MANAGER
CITY OF KEY BISCAYNE
85 WEST MACINTYRE STREET
KEY BISCAYNE FL 33149

MAYOR
CITY OF NORTH MIAMI
776 N E 125 STREET
NORTH MIAMI FL 33161

MAYOR
INDIAN CREEK VILLAGE
50 INDIAN CREEK ISLAND
INDIAN CREEK VILLAGE FL 33154

MAYOR
CITY OF MIAMI SHORES
10050 N E 2 AVENUE
MIAMI SHORES FL 33138

MAYOR
NORTH BAY VILLAGE
7903 EAST DRIVE
NORTH BAY VILLAGE FL 33141

MAYOR
CITY OF MIAMI
3500 PAN AMERICAN DRIVE
MIAMI FL 33133

MAYOR
CITY OF WEST MIAMI
901 S W 62 AVENUE
WEST MIAMI FL 33144

MAYOR
VILLAGE OF KEY BISCAYNE
85 WEST MACINTYRE STREET
KEY BISCAYNE FL 33149

MAYOR
TOWN OF GOLDEN BEACH
ONE GOLDEN BEACH DR
GOLDEN BEACH FL 33160

TOWN MANAGER
TOWN OF GOLDEN BEACH
TOWN HALL
ONE GOLDEN BEACH DRIVE
GOLDEN BEACH FL 33160

TOWN MANAGER
TOWN OF SURFSIDE
9293 HARDING AVENUE
SURFSIDE FL 33154

MAYOR
TOWN OF SURFSIDE
9293 HARDING AVENUE
SURFSIDE FL 33154

VILLAGE MANAGER
VILLAGE OF BAL HARBOUR
655 96 STREET
BAL HARBOUR FL 33154

MAYOR
VILLAGE OF BAL HARBOR
655 96 STREET
BAL HARBOR FL 33154

TOWN MANAGER
TOWN OF BAY HARBOR ISLAND
TOWN HALL
9665 BAY HARBOR TERRACE
BAY HARBOR ISLAND FL 331543

MAYOR
TOWN OF BAY HARBOR ISLAND
9655 BAY HARBOR TERRACE
BAY HARBOR ISLAND FL 33154

CHAIRPERSON
PALM BEACH COUNTY BOARD OF
COUNTY COMMISSIONERS
301 N OLIVE AVENUE 12TH FLOOR
WEST PALM BEACH FL 33401

CHAIRPERSON
BROWARD COUNTY BOARD OF COUNTY
COMMISSIONERS
115 S ANDREWS AVENUE ROOM 421
FT LAUDERDALE FL 33301-1872

CHAIRPERSON
DADE COUNTY BOARD OF COUNTY COMMISSIONERS
METRO DADE CENTER
111 N W 1ST STREET
MIAMI FL 33128

THE HONORABLE RICK MINTON
FLORIDA HOUSE OF REPRESENTATIVES
2300 VIRGINIA AVE RM 200
FORT PIERCE FL 34982

THE HONORABLE TOM WARNER
FLORIDA HOUSE OF REPRESENTATIVES
957 S FEDERAL HWY
STUART FL 34994

THE HONORABLE SHARON MERCHANT
FLORIDA HOUSE OF REPRESENTATIVES
721 U S HWY 1 #110
NORTH PALM BEACH FL 33408

THE HONORABLE ADDIE GREENE
FLORIDA HOUSE OF REPRESENTATIVES
330 CLEMATIS ST SUITE 205
WEST PALM BEACH FL 33401

THE HONORABLE LOIS FRANKEL
FLORIDA HOUSE OF REPRESENTATIVES
1645 PALM BEACH LAKES SUITE 290
WEST PALM BEACH FL 33401

THE HONORABLE ED HEALEY
FLORIDA HOUSE OF REPRESENTATIVES
50 S MILITARY TRAIL #205
WEST PALM BEACH FL 33415

THE HONORABLE WILLIAM ANDREWS
FLORIDA HOUSE OF REPRESENTATIVES
777 E ATLANTIC AVE SUITE 226
DELRAY BEACH FL 33483

THE HONORABLE SUZANNE JACOBS
FLORIDA HOUSE OF REPRESENTATIVES
990 S CONGRESS AVE
SUITE 5
DELRAY BEACH FL 33445

THE HONORABLE RON KLEIN
FLORIDA HOUSE OF REPRESENTATIVES
9070 KIMBERLY BLVD SUITE 60
BOCA RATON FL 33434

THE HONORABLE DEBBY SANDERSON
FLORIDA HOUSE OF REPRESENTATIVES
4800 N E 20 TERRACE #401
FORT LAUDERDALE FL 33308

THE HONORABLE WILLIAM G MYERS
FLORIDA STATE SENATE
50 KINDRED ST #301
STUART FL 34994-3058

THE HONORABLE ROBERT WEXLER
FLORIDA STATE SENATE
2500 N MILITARY TRAIL #252
BOCA RATON FL 33431

THE HONORABLE KENNETH JENNE II
FLORIDA STATE SENATE
612 SE 5TH AVE SUITE 3
FORT LAUDERDALE FL 33301

THE HONORABLE MATTHEW MEADOWS
FLORIDA STATE SENATE
3741 W BROWARD BLVD SUITE 206
FORT LAUDERDALE FL 33312-1041

THE HONORABLE JIM SCOTT
FLORIDA STATE SENATE
2000 E OAKLAND PARK BLVD
FORT LAUDERDALE FL 33306

THE HONORABLE THOMAS ROSSIN
FLORIDA STATE SENATE
505 S FLAGLER DRIVE SUITE 1001
WEST PALM BEACH FL 33401

THE HONORABLE JOHN RAYSON
FLORIDA HOUSE OF REPRESENTATIVES
950 N FEDERAL HIGHWAY SUITE 109
POMPANO BEACH FL 33062

THE HONORABLE TRACY STAFFORD
FLORIDA HOUSE OF REPRESENTATIVES
CITY PARK MALL 128 SE 1st STREET
FORT LAUDERDALE FL 33301

THE HONORABLE M MANDY DAWSON
FLORIDA HOUSE OF REPRESENTATIVES
612 N ANDREWS AVENUE
FORT LAUDERDALE FL 33311

THE HONORABLE JOSEPHUS EGGELETION
FLORIDA HOUSE OF REPRESENTATIVES
4315 N STATE ROAD 7
LAUDERDALE LAKES FL 33319

THE HONORABLE JACK TOBIN
FLORIDA HOUSE OF REPRESENTATIVES
4800 W COPANS ROAD
COCONUT CREEK FL 33063

THE HONORABLE BEN GRABER
FLORIDA HOUSE OF REPRESENTATIVES
2929 UNIVERSITY DRIVE SUITE 200
CORAL SPRINGS FL 33065

THE HONORABLE DEBBIE W SCHULTZ
FLORIDA HOUSE OF REPRESENTATIVES
13090 WEST STATE ROAD 84
DAVIE FL 33325

THE HONORABLE STEVEN BRIAN FEREN
FLORIDA HOUSE OF REPRESENTATIVES
400 N W 73rd AVENUE
PLANTATION FL 33317-1609

THE HONORABLE ANNE MACKENZIE
FLORIDA HOUSE OF REPRESENTATIVES
1000 S FEDERAL HIGHWAY #105
FORT LAUDERDALE FL 33316

THE HONORABLE FRED LIPPMAN
FLORIDA HOUSE OF REPRESENTATIVES
4000 HOLLYWOOD BOULEVARD SUITE 330
HOLLYWOOD FL 33021-6744

THE HONORABLE STEVEN GELLER
FLORIDA HOUSE OF REPRESENTATIVES
1250 E HALLANDALE BEACH BLVD SUITE 604
HALLANDALE FL 33009

THE HONORABLE ELAINE BLOOM
FLORIDA HOUSE OF REPRESENTATIVES
300 71st STREET SUITE 504
MIAMI FL 33141

THE HONORABLE HOWARD FORMAN
FLORIDA STATE SENATE
4000 HOLLYWOOD BOULEVARD SUITE 340-N
HOLLYWOOD FL 33021-6744

THE HONORABLE PETER M WEINSTEIN
FLORIDA STATE SENATE
7880 N UNIVERSITY DR #301
TAMARAC FL 33321

THE HONORABLE HARRY JOHNSTON
U S HOUSE OF REPRESENTATIVES
1501 CORPORATE DRIVE SUITE 205
BOYNTON BEACH FL 33426

THE HONORABLE PETER DEUTSCH
U S HOUSE OF REPRESENTATIVES
10100 PINES BOULEVARD
PEMBROKE PINES FL 33025

THE HONORABLE E CLAY SHAW
U S HOUSE OF REPRESENTATIVES
1512 E BROWARD BOULEVARD SUITE 101
FORT LAUDERDALE FL 33301

THE HONORABLE ALCEE L HASTINGS
U S HOUSE OF REPRESENTATIVES
2701 W OAKLAND PARK BLVD SUITE 200
OAKLAND PARK FL 33311

THE HONORABLE BOB GRAHAM
UNITED STATES SENATE
COURTHOUSE TOWER
44 W FLAGLER STREET SUITE 1715
MIAMI FL 33130

THE HONORABLE CONNIE MACK
UNITED STATES SENATE
777 BRICKELL AVENUE SUITE 704
MIAMI FL 33131

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

August 1, 1996

REPLY TO
ATTENTION OF
Planning Division
Environmental Branch

TO ADDRESSEES ON THE ENCLOSED LIST:

Enclosed for your review and comment is the Draft Feasibility Report and Draft Environmental Impact Statement (DEIS) for the Coast of Florida Erosion and Storm Effects Study, Region III.

Please provide any comments you may have within 45 days of the date of publication of the Notice of Availability of the DEIS in the Federal Register. If no comments are received within that 45-day period, it will be assumed that you have none. After receipt of comments, we will incorporate any necessary changes, and prepare the Final EIS.

Sincerely,

for A. J. Salem
Chief, Planning Division

Enclosure

LIST OF ADDRESSEES

**RECIPIENTS OF THE FEASIBILITY REPORT
AND DRAFT ENVIRONMENTAL IMPACT STATEMENT
COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY
REGION III**

FEDERAL AGENCIES

DIRECTOR
OFFICE OF FED. ACTIVITIES (A-104)
ENVIRONMENTAL PROTECTION AGENCY
401 M STREET S W
WASHINGTON DC 204060
(5 CYS)

DIRECTOR ECOLOGY AND CONSERVATION
US DEPARTMENT OF COMMERCE
ATTN: DONNA WIETING
14TH & CONSTITUTION AVENUE NW
HCHB SP ROOM 6117
WASHINGTON DC 20230
(5 CYS)

DIRECTOR
OFFICE OF ENVIRONMENTAL COMPLIANCE
DEPARTMENT OF ENERGY ROOM 4G064
1000 INDEPENDENCE AVENUE SW
WASHINGTON DC 20230 (2 CYS)

DIRECTOR
FEDERAL MARITIME COMMISSION
OFFICE OF ENERGY & ENV IMPACT
800 W CAPITOL STREET NW
WASHINGTON DC 20513-0001

FEDERAL EMERGENCY MANAGEMENT AGENCY
MITIGATION DIRECTORATE
500 C STREET SW ROOM 423
WASHINGTON DC 20472

DIRECTOR, OFFICE OF ENVIRONMENTAL
POLICY AND COMPLIANCE
DEPARTMENT OF THE INTERIOR
MAIN INTERIOR BUILDING, MS 2340
1849 C STREET NW
WASHINGTON DC 20240 (12 CYS)

EXECUTIVE DIRECTOR
ADVISORY COUNCIL ON HISTORIC PRESERVATION
1100 PENNSYLVAINIA AVENUE NW #809
WASHINGTON DC 20004-2590

DIRECTOR, ENVIRONMENTAL HEALTH & DISEASE
CONTROL - F29
CENTER FOR DISEASE CONTROL
1600 CLIFTON ROAD
ATLANTA GEORGIA 30333 (2 CYS)

US DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
PO BOX 141510
GAINESVILLE FL 32614-1510

REGIONAL ENVIRONMENTAL OFFICER HOUSING &
URBAN DEVELOPMENT
ROOM 600-C
75 SPRING STREET SW
ATLANTA GA 30303-3309
(2 CYS)

COMMANDER (OAN)
SEVENTH COAST GUARD DISTRICT
909 SE 1ST AVENUE
BRICKNELL PLAZA FEDERAL BLDG
MIAMI FL 33131-3050

REGIONAL DIRECTOR
INSURANCE & MITIGATION DIVISION
FEMA
1371 PEACHTREE STREET NE
ATLANTA GA 30303-3309

SOUTHERN REGION FORESTER
US FOREST SERVICE
DEPARTMENT OF AGRICULTURE
1720 PEACHTREE ROAD NW
ATLANTA GA 30309-2405

REGIONAL DIRECTOR
US FISH AND WILDLIFE SERVICE
1875 CENTURY BOULEVARD
ATLANTA GA 30345

FIELD SUPERVISOR
U S FISH AND WILDLIFE SERVICE
P O BOX 2676
VERO BEACH FL 32961-2676

MR HEINZ MUELLER
ENVIRONMENTAL POLICY SECTION
EPA REGION IV
345 COURTLAND STREET NE
ATLANTA GA 30365-2401
(5 CYS)

NATIONAL MARINE FISHERIES SERVICE
ENVIRONMENTAL ASSESSMENT BR
3500 DELWOOD BEACH ROAD
PANAMA CITY FL 32407-7499

NATIONAL MARINE FISHERIES SERVICE
OFFICE OF THE REGIONAL DIRECTOR
9721 EXECUTIVE CENTER DRIVE
ST PETERSBURG FL 33702

NATIONAL MARINE FISHERIES SERVICE
CHIEF, PROTECTED SPECIES BRANCH
9721 EXECUTIVE CENTER DRIVE
ST PETERSBURG FL 33702

NATIONAL MARINE FISHERIES SERVICE
SUITE 103
11420 NORTH KENDALL DRIVE
MIAMI FL 33176

STATE AGENCIES

STATE CLEARINGHOUSE
DEPARTMENT OF COMMUNITIY AFFAIRS
2555 SHUMARD OAK BOULEVARD
TALLAHASSEE FL 32399-2100
(16 CYS)

FLORIDA DEPT OF ENV PROTECTION
OFFICE OF AQUATIC PRESERVES
1801 SE HILLMORE DRIVE SUITE 0204
PORT ST LUCIE FLORIDA 34952-7551

FLORIDA DEPT OF ENV PROTECTION
BUREAU OF STATE LANDS
7400 H SOUTH GEORGIA AVENUE
WEST PALM BEACH FL 33405

FLORIDA DEPT OF ENV PROTECTION
MARINE RESEARCH INSTITUTE
19100 S.E. FEDERAL HIGHWAY
TEQUESTA FL 33469

FLORIDA DEPT OF ENV PROTECTION
SOUTH FLORIDA DISTRICT
1900 SOUTH CONGRESS AVENUE
WEST PALM BEACH FL 33406

FLORIDA DEPT OF ENV PROTECTION
DIVISION OF STATE LANDS
1900 SOUTH CONGRESS AVENUE
WEST PALM BEACH FL 33406

SOUTH FLORIDA WATER MANAGEMENT
DISTRICT
3301 GUN CLUB ROAD
WEST PALM BEACH FL 33416

COUNTY AGENCIES (PALM BEACH CO)

PALM BEACH COUNTY DEPARTMENT OF
ENVIRONMENTAL RESOURCES MANAGEMENT
3323 BELVEDERE ROAD BUILDING 502
WEST PALM BEACH FL 33406
(2 cys)

PALM BEACH COUNTY PARKS AND
RECREATION
2700 6TH AVENUE SOUTH
LAKE WORTH FL 33461

PALM BEACH COUNTY HEALTH UNIT
ENVIRONMENTAL SCIENCE AND ENGINEERING
901 EVERNIA STREET
WEST PALM BEACH FL 33401

PALM BEACH COUNTY PLANNING ZONING
AND BUILDING
100 AUSTRALIAN AVENUE
WEST PALM BEACH FL 33406

PALM BEACH COUNTY SOIL AND WATER
CONSERVATION
559 N MILITARY TRAIL
WEST PALM BEACH FL 33415-1311

PALM BEACH COUNTY TOURIST
DEVELOPMENT COUNCIL
1555 PALM BEACH LAKES BOULEVARD
SUITE 204
WEST PALM BEACH FL 33401

COUNTY AGENCIES (BROWARD CO)

DIRECTOR
BROWARD COUNTY DEPARTMENT
OF NATURAL RESOURCES PROTECTION
218 S W FIRST AVENUE
FORT LAUDERDALE FL 33301

B JACK OSTERHOLT
BROWARD COUNTY ADMINISTRATOR
115 S ANDREWS AVENUE ROOM 409
FORT LAUDERDALE FL 33301

ERIC MYERS DIRECTOR
BIOLOGICAL RESOURCES DIVISION
BROWARD CO DEPT OF NATURAL
RESOURCES PROTECTION
218 S W FIRST AVENUE
FORT LAUDERDALE FL 33301

STEPHEN H HIGGINS ASST. DIRECTOR
BIOLOGICAL RESOURCES DIVISION
BROWARD CO DEPT OF NATURAL
RESOURCES PROTECTION
218 S W FIRST AVENUE
FORT LAUDERDALE FL 33301 (2 CYS)

BROWARD COUNTY PLANNING COUNCIL
ADMINISTRATOR
115 S ANDREWS AVENUE ROOM 307
FORT LAUDERDALE FL 33301-4801

BROWARD COUNTY PLANNING DIVISION
DIRECTOR
115 S ANDREWS AVENUE
FORT LAUDERDALE FL 33301

COUNTY AGENCIES (DADE CO)

MR BRIAN FLYNN
DEPT OF ENVIRONMENTAL RESOURCE MGT
33 S W 2ND AVENUE SUITE 3
MIAMI FL 33130
(2 CYS)

JEAN EVOY
SENIOR PLANNER
METRO DADE PLANNING DEPARTMENT
STEPHEN P CLARK CENTER SUITE 1210
MIAMI FL 33128

DIRECTOR
METRO DADE PARK AND RECREATION
DEPARTMENT
50 S W 32 ROAD
MIAMI FL 33129

OTHER AGENCIES

JUPITER INLET DISTRICT
400 N DELAWARE BOULEVARD
JUPITER FL 33458

PORT OF PALM BEACH DISTRICT
BOX 9935
RIVIERA BEACH FL 33404

SOUTH LAKE WORTH INLET DISTRICT
P O BOX 3645
LANTANA FL 33465

FLORIDA INLAND NAVIGATIONAL
DISTRICT
1314 MARCINSKI ROAD
JUPITER FL 33477

TREASURE COAST REGIONAL PLANNING
COUNCIL
P O BOX 1529
PALM CITY FL 33490-1529

CHAIRMAN
HILLSBORO INLET IMPROVEMENT AND
MAINTENANCE DISTRICT
812 NW 6TH AVENUE
FORT LAUDERDALE FL 33311

DIRECTOR
PORT EVERGLADES AUTHORITY
1850 ELLER DRIVE
FORT LAUDERDALE FL 33316

SOUTH FLORIDA REG PLNG COUNCIL
3440 HOLLYWOOD BLVD SUITE 140
HOLLYWOOD FL 33021

DIRECTOR
PUBLIC WORKS DEPT
CITY OF MIAMI BEACH
1700 CONVENTION CENTER DRIVE
MIAMI BEACH FL 33149

INTEREST GROUPS

MR DONALD J DUERR
BIODIVERSITY ASSOCIATES
PO BOX 6032
LARAMIE WY 82070

AMERICAN LITTORAL SOCIETY
2809 BIRD AVENUE SUITE 162
MIAMI FL 33133

FLORIDA SHORE AND BEACH
PRESERVATION ASSOCIATION (FSBPA)
864 EAST PARK AVENUE
TALLAHASSEE FL 32301

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

July 31, 1996

REPLY TO
ATTENTION OF
Planning Division
Environmental Branch

Director
Office of Federal Activities (A-104)
Environmental Protection Agency
401 M Street Southwest
Washington, DC 20460

Dear Sir:

Enclosed are five copies of the Draft Environmental Impact Statement for the Coast of Florida Erosion and Storm Effects Study, Region III for publication of a notice of availability in the Federal Register.

Sincerely,

For A. J. Salem
Chief, Planning Division

Enclosures

United States Department of the Interior
FISH AND WILDLIFE SERVICE
P.O. BOX 2676
VERO BEACH, FLORIDA 32961-2676

July 9, 1996

Colonel Terry Rice
District Engineer
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019

Attn: Planning Division

Dear Colonel Rice:

This letter acknowledges the U. S. Fish and Wildlife Service's (FWS) April 10, 1996, receipt of your March 28, 1996, letter, which responded to the FWS' request for information that would be required before initiation of formal section 7 consultation under the Endangered Species Act of 1973, as amended, (16 U.S.C. 1531 et seq.). The consultation concerns the possible effects on the threatened loggerhead sea turtle (*Caretta caretta*), endangered green sea turtle (*Chelonia mydas*), endangered leatherback sea turtle (*Dermochelys coreacia*) and endangered hawksbill (*Eretmochelys imbricata*) of your proposed beach renourishment projects included within the Coast of Florida Study, Region III.

All information required of you to initiate consultation was either included with your letter or is otherwise accessible for our consideration and reference. We have assigned Log Number 4-1-96-268 to this consultation. Please refer to that number in future correspondence on this consultation.

Section 7 allows the FWS up to 90 days to conclude formal consultation with your agency and an additional 45 days to prepare our biological opinion (unless we mutually agree to an extension). Therefore, we expect to provide you with our biological opinion before August 23, 1996.

As a reminder, section 7(d) of the Endangered Species Act prohibits Federal action agencies from making irretrievable or irreversible commitments of resources that limit future options once they have initiated formal consultation with the FWS. This requirements insures agency actions do not preclude the formulation or implementation of reasonable and prudent alternatives that avoid jeopardizing the continued existence of endangered or threatened species or destroying or modifying their critical habitats.

If you have any questions or concerns about this consultation or the consultation process in general, please feel free to contact me or Charles W. Sultzman at (561) 562-3909.

Sincerely,

Craig Johnson
Supervisor, South Florida Ecosystem Office

July 9, 1996
~~June 27, 1996~~

Planning Division
Environmental Branch

Mr. Craig Johnson
U.S. Fish and Wildlife Service
Post Office Box 2676
Vero Beach, Florida 32961-2676

Dear Mr. Johnson:

Thank you for taking several hours from your busy schedule to meet in our office with members of my environmental staff on June 18, 1996.

I have enclosed a memorandum concerning highlights of the meeting, the issues discussed, and possible resolution. If you have any comments, please let me or Dr. Hanley (Bo) Smith of my staff know. Dr. Smith can be reached at 904-232-1685 or fax at 904-232-3442 or e-mail at bo·smith@usace·army·mil.

I look forward to resolution of these issues and continued cooperation between our offices.

Sincerely,

A. J. Salem
Chief, Planning Division

Enclosure

bcc:
CESAJ-DP-I (Stevens)
CESAJ-PD-PC (Granat)
CESAJ-DP (Bonner)
CESAJ-PD-P (Strain)

~~Dupes~~/CESAJ-PD-ER/1689/mw
Dugger/CESAJ-PD-ER
~~Smith~~/CESAJ-PD-E
~~Strain/CESAJ-PD-P~~
~~Bonner/CESAJ-DP~~
Salem/CESAJ-PD

MEMORANDUM FOR RECORD

SUBJECT: Meeting of 18 June 1996, with Craig Johnson, U.S. Fish and Wildlife Service

1. I am providing notes on the subject meeting. The main topic of discussion was timely response from the Vero Beach Field Office on Coordination Act Reports (CAR), Planning Aid Letters (PAL), Section 7 Consultation under the Endangered Species Act (ESA), and other requested actions.

2. **Specific Projects.** (See also enclosed table.)

a. Test 7, Experimental Program, Remedial Action Plan for Cape Sable Seaside Sparrow. FWS does not intend to provide any remedial action plan for the Cape Sable Seaside Sparrow beyond that discussed and prepared at the 24 April 1996, meeting of the Multi-Species Recovery Team. Mr. Johnson agreed he would formalize the process by sending a letter with a copy of the plan stating the requirements of the Biological Opinion are satisfied.

b. Lee County Shore Protection, Gasparilla & Estero Islands, Endangered Species List. Mr. Johnson acknowledged that 2 months is too long to wait for a species list. This kind of delay should not normally occur.

c. Coast of Florida, Region III, Section 7 Consultation and CAR. This is a time sensitive action. We discussed that the contractor's field data was being forwarded to FWS along with a request to complete the CAR by 15 July. During the discussion, it was revealed that there is a difference of opinion between FWS and Corps staff. FWS staff believes that they cannot prepare a CAR for 90 miles of shoreline without detailed information on resources involved. Corps staff provided field data that was less intensive than for smaller projects but believed to be adequate for a project of the scope and programmatic nature of the COF. Mr. Johnson said he would discuss this with his staff along with the issue of whether a programmatic CAR should be provided and whether there would be enough detail in the field information to support the CAR. If this cannot be resolved, we agreed that PD-ER staff (Dugger and Dupes) would meet in the Vero Beach FWS office immediately to try to resolve the issue.

d. Pinellas County Shore Protection, Sand Key, CAR. This is a time sensitive action. Mr. Johnson is currently reviewing and editing the Draft CAR. We should receive it within the next couple weeks.

e. Dade County Shore Protection (Surfside/South Miami Beach, Sunny Isles Mod, and Bal Harbour). This is a time sensitive action. Mr. Johnson was not aware of a deadline on these and will discuss these with his staff.

f. Lido Key Reconnaissance, PAL. This is a time sensitive action. Mr. Johnson will look into this matter with his staff.

g. C&SF, Blue Cypress Water Management Area, Upper St. Johns, Section 7 Consultation. Mr. Johnson says the Biological Opinion (BO) is being edited. It will be a no jeopardy opinion with an incidental take statement. We should expect to get the BO by the end of the month.

3. **General Discussion.**

a. Letter verses Report for a CAR. Mr. Johnson believes that a letter (2 or 3 pages) should in many cases adequately document the coordination history, issues, and resolution to satisfy the CAR requirements. We stated that we usually receive a lengthy report but would welcome the simpler letter format.

b. Application of Coordination Act to Coastal Projects. Mr. Johnson believes that the act applies to coastal projects. He does not necessarily agree that the FWS should have the lead for CARs focused on marine resources. Mr. Johnson says the National Marine Fisheries Service (NMFS) has taken the lead on CARs when he worked for them in Alaska. He will further research the authority for the Corps to directly fund NMFS for this.

c. Early Involvement. All agreed that early involvement and consultation with the FWS and NMFS is important and it was agreed that we would review our procedures to assure that this was being done to the extent practical or if not, how it could be improved. Mr. Johnson suggested we take advantage of their "early consultation" process, which would provide a preliminary biological opinion that could be finalized later in the process (see part 4.c. below). This would give us early indication of Fish and Wildlife issues and opinions affecting the project and only require a final letter confirming the earlier opinion and that Section 7 consultation is satisfied.

d. Data Base. Vero Beach is using a data base to respond to inquiries. If we place a latitude and longitude (or possibly UTM coordinates) on our correspondence, FWS can use the data base to quickly provide a list of protected species and other resources of special interest.

4. Follow-up Action.

a. Mr. Johnson will further research some of the issues identified above and will discuss pending actions with his staff.

b. We plan to follow-up with a phone call early next week and offer to meet with FWS staff to resolve any remaining issues.

c. In an effort to assure that FWS and NMFS are fully involved in project planning, PD-E will review our procedures to incorportate early consultation, Endangered Species Act requirements, and Fish and Wildlife Coordination Act requirements into the Corps' key milestones. We will outline the procedures and submit a draft plan to FWS in about 30 days.

KENNETH DUGGER
Chief, Environmental Coordination Section

PENDING AND ANTICIPATED ACTIONS WITH FWS, VERO BEACH

PROJECT	ACTION REQUESTED	DATE OF REQUEST	DUE DATE	STATUS
Lido Key Reconnaissance Study	Planning Aid Letter (SOW, Cost, and MIPR)	Jan 29 (duplicates Feb 14, Mar 18, Mar 20, May 9) 1996	Planning Aid Ltr, 5/26/96	No reply on SOW, cost estimate, or MIPR
Bal Harbour, Dade County Shore Protection	Coordination Act Report (SOW and Cost Estimate)	Draft SOW faxed 4/18/96	Dive Borrow Area 6/30/96	No reply on Draft SOW
Project Mod Sunny Isles Dade County SP	Coordination Act Report	Draft SOW faxed 4/18/96	Dive Borrow Area 6/30/96	No reply on Draft SOW
Surfside & S. Miami Beach, Dade Co. SP	Coordination Act Report	Pipeline Corridor Identified March 96	CAR/Sec 7, 6/30/96	SCUBA survey of Apr 24-26, 96 postponed by FWS until May 27-31, 1996
Lee County Shore Protect. Gasparilla/Estero Islands	Coordination Act Report (SOW and Cost Estimate)	Anticipated around Oct 1, 96	Draft CAR 12/01/96	Beach Survey, Core Borings, and Side Scan Sonar being initiated
Coast of Florida Region III	Coordination Act Report	Contractor Field Survey Report to FWS 6/19/96	Draft CAR 7/30/96	FWS to use contractor's field data to complete CAR
Pinellas County Shore Protection. Sand Key	Coordination Act Report	May 31, 1995	Draft CAR 12/4/95	Draft CAR of Dec 1995, being revised by FWS Expect a Copy Around end of June
Coast of Florida Region IV	Coordination Act Report & Sec. 7 Consultation	SOW expected June 96	?	Feasibility Cost Sharing Agreement with State being negotiated
Coast of Florida Region III	Section 7 Consultation	Initiated Oct 5, 1995		Awaiting Biological Opinion
Lee Co. Shore Protection Gasparilla & Estero Is.	Endangered Species List Requested	List Requested Apr 18, 1996		List Received Jun 10, 1996
C&SF, Blue Cypress WMA, Upper St. Johns	Section 7 Consultation	Formal Consultation initiated July 1995	Bio. Opinion due Jan 96	Awaiting Biological Opinion, Expect BO around end of June (no jeopardy w/ incidental take statement)
Test 7, Experimental Program	Remedial Action Plan Cape Sabel Seaside Sparrow	Apr 24, 96 (at mult. species recovery team meeting)	Jun 30, 1996	FWS not going to write a Remedial Action Plan use plan discussed at team meeting

JUN 2 1 1996

Planning Division
Environmental Branch

Mr. Craig Johnson
U.S. Fish and Wildlife Service
P.O. Box 2676
Vero Beach, Florida 32961-2676

Dear Mr. Johnson:

I am forwarding the results of the field investigations for the Coast of Florida Erosion and Storm Effects Study, Region III. Since your office indicated they were unable to perform the field work under the Scope of Work submitted by facsimile to your office on August 3, 1995, I am also enclosing an amended Scope of Work.

I understand that your staff is concerned that the spacing of transects is greater than that normally used to support a Coordination Act Report (CAR) for shore protection activities. However, I believe a more detailed field investigation is both impracticable and unnecessary at this time. The enclosed field investigation of the approximate 90 miles of coastal area involved 22 transects and was performed by a contractor at a cost of over $55,000. It is uncertain at this time whether the final feasibility report will recommend any Federal participation or when aspects of the project would be constructed.

I request that the CAR address the likely range of impacts based on the information provided and the several CARs already conducted by your office for shore protection in Dade, Broward, and Palm Beach Counties. It appears that such a report could satisfy the requirements of Section 2(b) of the Fish and Wildlife Coordination Act by providing your recommendations (as specific as is practicable) with respect to 1) possible damage to wildlife resources, 2) means and measures that should be adopted to prevent the loss of or damage to such resources, and 3) features recommended for wildlife conservation and development. I request that, if needed, a more specific determination of resources and impacts be deferred until a particular phase or aspect of the project is more definitely considered for construction and Federal participation.

Please sign the enclosed amended Scope of Work and return it by mail and facsimile (904-232-3442) so we can fund the report. It is very important that you provide the requested CAR by July 15, 1996. Please contact me if this is not feasible.

Sincerely,

A. J. Salem
Chief, Planning Division

Enclosures

bcc:
DP-I (Stevens)
PD-PC (Granat)

Dupes/CESAJ-PD-ER/1689/
Dugger/CESAJ-PD-ER
Smith/CESAJ-PD-E
Strain/CESAJ-PD-P
Bonner/CESAJ-DP
Salem/CESAJ-PD

SCOPE OF WORK
FISH AND WILDLIFE COORDINATION ACT
COAST OF FLORIDA EROSION AND
STORM EFFECTS STUDY

REGION III

1.0 Project Title: Coast of Florida Erosion and Storm Effects Study - Region III.

2.0 Authorization Status: General Investigation, Feasibility Study.

3.0 Project Description: The Coast of Florida Study (COFS) is a multi-year, phased regional feasibility examining the entire developed east coast ocean shoreline and west coast gulf shoreline. The objective of the study is to develop a comprehensive understanding of the coastal processes and associated environmental resources to help in the development of enhanced shore protection projects while reducing environmental impacts. The current region being studied (Region III), which includes Dade, Broward and Palm Beach Counties, is nearing completion. Alternative recommendations for 21 project segment modifications have been identified through the COFS. These modifications include initial beach restoration for four new sites, (Fort Lauderdale, Highland Beach, Dania and Golden Beach) and improvements at two existing sand transfer plants (Lake Worth Inlet and South Lake Worth Inlet) in addition to modifications at other existing authorized beach nourishment sites. New nearshore berm disposal sites have also been identified as project components adjacent to several project locations. The location of identified hardground areas have been taken into consideration by scaling back recommended project footprints and carefully locating nearshore berms to reduce and/or avoid associated impacts to hardground resources. The recommended plans are discussed in the Draft Feasibility Report for the study, dated May 1995. A preliminary review copy of this report, which includes a Draft Environmental Impact Statement has been provided to the U.S. Fish and Wildlife Service Field Office in Vero Beach, Florida.

An Environmental Impact Statement (EIS) is being prepared to address the environmental impacts of the study alternatives and the selected plan. Detailed plans for some of the more complex proposed projects will not be developed during this feasibility phase. For instance, the exact location and detailed design of sand transfer plants will not be known. The general location of new sand sources have been identified during the feasibility phase; however, detailed design and analysis will take place during post authorization planning, engineering and design (PED) activities for each project. Sufficient uncertainty may exist concerning impacts to fish and wildlife resources that further environmental investigation and analyses may be needed during PED for each project. This would include endangered species coordination, and the appropriate NEPA document and coordination. More detailed investigations by the FWS would take place as needed at that time.

4.0 Work Required of the Fish and Wildlife Service (FWS):

4.1 Review of Literature and Existing Data: ....1 biologist, 10 days

Perform a review of the literature and existing data relevant to the Coast of Florida Study. This review should include, but not be limited to: 1) previous Planning Aid Reports and Coordination Act Reports prepared by the FWS for beach nourishment projects within the Region III study area, 2) existing Inlet Management Plans for inlets within the study area, 3) any information and/or data Dade, Broward, and Palm Beach Counties may have on fish and wildlife resources within the study area, 4) report entitled, Hardground and Seagrass Assessment, Coast of Florida Erosion and Storm Effects Study, Dade, Broward, and Palm Beach Counties, prepared by Lotspeich and Associates, Inc., for the Corps of Engineers.

4.2 Coordination Act Report (CAR):

Prepare and Coordinate Draft CAR ....1 biologist, 10 days

Review comments to Draft CAR and prepare Final CAR............1 biologist, 3 days

Prepare a Coordination Act Report in accordance with the Fish and Wildlife Coordination Act that will satisfy Section 2(b) of the Act. The CAR shall include:

a. Determine and evaluate the effects of potential increases in siltation and sedimentation as a result of the proposed project on nearby natural habitats.

b. Discuss alternative to minimize or avoid significant impacts to natural resources. Recommendations to mitigate possible impacts.

c. Include copies of all correspondence pertaining to the FWCA studies and report.

4.3 Report submittal:

a. A draft CAR shall be submitted to the Corps by July 15, 1996.

b. A final CAR shall be submitted to the Corps within 45 days after submittal of the draft CAR.

5.0 Information to be provided by the Corps: Provide a copy of the report entitled, Hardground and Seagrass Assessment, Coast of Florida Erosion and Storm Effects Study, Dade, Broward, and Palm Beach Counties, prepared by Lotspeich and Associates, Inc

6.0 Agreement:

By completion of the enclosed DD Form 448, transferring funds for this work in accordance with the enclosed itemized cost estimate, the undersigned certify intention to perform respective tasks within the time frames stated in this Scope of Work.

CRAIG JOHNSON Field Supervisor U.S. Fish and Wildlife Service	HANLEY K. SMITH Chief, Environmental Branch U.S. Army Corps of Engineers
DATE:_______________	DATE:_______________

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

March 28, 1996

Planning Division
Environmental Branch

Mr. Craig Johnson
South Florida Ecosystem Office
U.S. Fish and Wildlife Service
Post Office Box 2676
Vero Beach, Florida 32961-2676

Dear Mr. Johnson:

This is in reply to your letter dated, February 14, 1996, requesting additional information regarding the current Section 7 consultation for Region III of the Coast of Florida Erosion and Storm Effects Study (FWS Log No.: 4-1-96-268).

Your letter requested the number of proposed projects that could potentially be constructed within any single year. Enclosed is a table showing past nourishment activities, anticipated future nourishments, and the scheduled renourishment intervals for projects and proposed projects within Region III. You should be aware that this is not a firm schedule and is subject to change based on the need as well as availability of Federal and sponsor funding.

I note that the Biological Assessment (BA) was submitted and formal consultation was requested by our letter dated October 5, 1995 and not December 2, 1995 as stated in your letter. It is important that we conclude consultation promptly. Please inform me if the Biological Opinion cannot be completed by April 30, 1996.

If you have any questions, you can contact Mr. Mike Dupes at 904-232-1689.

Sincerely,

for A. J. Salem
Chief, Planning Division

Enclosure

Coast of Florida Erosion and Storm Effects Study - Draft Feasibility Report with Draft EIS for Region III

Estimated Schedule for Beach Nourishment.

	Renourishment Interval (Yrs) *	Beach Nourishment; Anticipated (A), Initial (I), Last (L), Next (N), Proposed by Sponsor (P), Unscheduled (U)
Palm Beach County:		
Jupiter Carlin	7	1995 I
Ocean Cay/Juno	7	1998 P (Juno)
N. End Palm Beach Island	4	U
Midtown (Palm Beach Island)	4	U **
S. End Palm Beach Island	4	U
Ocean Ridge	8	1996/1997 I
Delray Beach	7	1992 L
Highland Beach	7	U
Boca Raton	8	1997 N
Broward County:		
Deerfield Beach/Highland Beach (Segment I)	7	U
Hillsboro Inlet to Port Everglades (Segment II)		
Pompano/Lauderdale-By -The-Sea	12	1998 P (1984 L)
Fort Lauderdale	6	1998 P
Port Everglades Inlet to Bakers Haulover Inlet (Segment III)		
J.U. Lloyd	6	1998 P (1989 L)
Hollywood/Hallandale	6	1998 P (1991 L)
Dania	6	1998 P

	Renourishment Interval (Yrs) *	Beach Nourishment; Anticipated (A), Initial (I), Last (L), Next (N), Proposed by Sponsor (P), Unscheduled (U)
Dade County:		
Golden Beach	6	U
Sunny Isles	10	1997 N
Bakers Haulover Inlet to Government Cut		
Bal Harbour, Surfside, and Miami Beach	3	1997 N
Key Biscayne	7	1987 L

*** Source of data is the Draft Feasibility Report with Draft EIS.**

**** Town of Palm Beach partially constructed in 1995 .**

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive N.
St. Petersburg, FL 33702

MAR 2 1 1996

F/SEO13:JEB

Mr. A. J. Salem
Chief, Planning Division
Jacksonville District
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019

Dear Mr. Salem:

This responds to your letter of October 12, 1995, requesting consultation on the proposed actions recommended in the Coast of Florida Erosion and Storm Effects Study. The actions involve beach restoration and nourishment activities and improvements to two sand transfer plants in Region III, which includes Palm Beach, Broward, and Dade counties in Florida. A biological assessment (BA) was transmitted pursuant to Section 7 of the Endangered Species Act of 1973 (ESA).

We have reviewed the BA and concur with your determination that the proposed project will not adversely affect listed species under our purview. This determination is based on the requirement that the Corps of Engineers abide by all protective measures included in the August 25, 1995, biological opinion addressing dredging activities in the Southeast Region. However, the National Marine Fisheries Service is concerned over the possible use of aragonite or other calcium-carbonate sands from the Bahama Bank for beach nourishment projects. We are concerned that ecological damage may take place by the removal of these sands from an area where environmental controls are less rigorous than in the United States. We are also concerned that sea turtle eggs laid in aragonite sands may not incubate in the same manner as eggs laid in native sands. The U.S. Fish and Wildlife Service has jurisdiction over sea turtles while they are on land and they should be consulted on the use of these sands.

This concludes consultation responsibilities under Section 7 of the ESA. However, consultation should be reinitiated if new information reveals impacts of the identified activity that may affect listed species or their critical habitat, a new species is listed, the identified activity is subsequently modified, or critical habitat is determined that may be affected by the proposed activity.

If you have any questions please contact Jeffrey Brown, Fishery Biologist, at (813) 570-5312.

Sincerely,

Andrew J. Kemmerer
Regional Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE
P.O. Box 2676
Vero Beach, Florida 32961-2676

IN REPLY REFER TO

February 14, 1996

Colonel Terry L. Rice
District Engineer
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019

Attn: Planning Division

FWS Log No.: 4-1-96-268
Project: Coast of Florida Study

Dear Colonel Rice:

Thank you for your letter dated December 2, 1995, and the attached Biological Assessment (BA) for the project referenced above pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). The U.S. Army Corps of Engineers (COE) proposes to modify 21 Civil Works project segments which involve beach nourishment and renourishment in Dade, Broward and Palm Beach Counties, Florida. Fifteen of the projects have been previously authorized. Four of the nourishment projects are new and require authorization and initial placement of beach fill. The new projects are located in Fort Lauderdale, Highland Beach, Dania, and Golden Beach. Two of the projects involve improvement of existing sand transfer plants. These are located at Lake Worth Inlet and South Lake Worth Inlet.

The COE determined that these proposed actions "may affect" threatened and endangered sea turtles. Based upon our preliminary review, we concur with your determination for federally listed sea turtles, which include the threatened loggerhead sea turtle (*Caretta caretta*) as well as the endangered green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coreacia*), and hawksbill sea turtle (*Eretmochelys imbricata*). Currently, there is no critical habitat designated for the sea turtles listed above.

Before formal consultation for threatened and endangered sea turtles under the ESA can be initiated, the FWS will need to know how many of the proposed projects could potentially be constructed within any single year. This information is important for our estimation of the total adverse affects which could be brought to bear on each year class of hatchling sea turtles. Once this information is received by the Fish and Wildlife Service (FWS), formal consultation will be initiated and a Biological Opinion will be issued shortly after the conclusion of the consultation period.

According to your BA, the COE has determined that the proposed projects will have "no effect" on the endangered manatee (*Trichechus manatus latirostris*). The BA also states that the standard manatee protection construction conditions will be followed during construction operations. Potential risk of injury to manatees should be negligible as a result of these protection measures. Thus, we conclude that the proposed actions are not likely to affect the manatee. Although the BA did not include a determination for adverse affects to designated critical habitat for the manatee, the FWS concludes that no adverse modification or destruction of designated critical habitat for the manatee will occur as a result of the proposed projects.

We await the requested information. If you have any questions on this matter, please contact Chuck Sultzman of our office at (407)562-3909.

Sincerely yours,

Craig Johnson
Supervisor, South Florida Ecosystem Office

cc:
NMFS, Miami, FL
FDEP, Tallahassee, FL
FGFWFC, Vero Beach, FL

October 12, 1995

Planning Division
Environmental Branch

Mr. Charles A. Oravetz
Chief, Protected Species Management Branch
National Marine Fisheries Service
9721 Executive Center Drive North
St. Petersburg, Florida 33702

Dear Mr. Oravetz:

This is in reference to Region III of the Coast of Florida Erosion and Storm Effects Study which is currently being conducted by the U.S. Army Corps of Engineers (Corps). Enclosed is a description of the study and a discussion of the recommended plan.

On August 25, 1995, the National Marine Fisheries Service (NMFS) issued a Regional Biological Opinion (RBO) for hopper dredging of channels and beach nourishment activities in the Southeastern United States from North Carolina through Florida East Coast. The Corps has determined that the proposed actions recommended in the referenced study are covered in the RBO and no further consultation with NMFS under Section 7 of the Endangered Species Act is required at this time.

Your concurrence on this determination is requested. If you have any questions or need any additional information, please contact Mr. Mike Dupes at 904-232-1689.

Sincerely,

A. J. Salem
Chief, Planning Division

Enclosure

STUDY DESCRIPTION
COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY
REGION III

1. PROJECT AUTHORITY: The Coast of Florida Erosion and Storm Effects Study (COFS) is being conducted in response to Section 104, Public Law (PL) 98-360, dated July 16, 1984, and a resolution date August 8, 1984, by the Committee on Public Works and Transportation, of the U.S. House of Representatives.

2. LOCATION: The study area is located along the Atlantic Ocean shoreline of Palm Beach, Broward, and Dade Counties on the lower southeast coast of Florida (Figure 1). Palm Beach County is the northernmost county in the study area followed by Broward County and then Dade County at the southern end. The northern limit is Jupiter Inlet and is about 80 miles north of Miami Beach. The southern limit of the study area is the southern tip of Key Biscayne in Dade County. The study area comprises approximately 88 miles of Atlantic Ocean shoreline.

3. DESCRIPTION OF THE PROPOSED ACTION: The COFS is a multi-year, phased regional feasibility study examining the entire developed east coast ocean shoreline and west coast gulf shoreline. The objective of the study is to develop a comprehensive understanding of the coastal processes and associated environmental resources to help in the development of enhanced shore protection projects while reducing environmental impacts. The current region being studied (Region III), which includes Dade, Broward and Palm Beach Counties, is nearing completion. Alternative recommendations for 21 project segment modifications have been identified through the COFS. These modifications include initial beach restoration for four new sites, (Fort Lauderdale, Highland Beach, Dania and Golden Beach) and improvements at two existing sand transfer plants (Lake Worth Inlet and South Lake Worth Inlet) in addition to modifications at other existing authorized beach nourishment sites. New nearshore berm disposal sites have also been identified as project components adjacent to several project locations. Alternative sand sources for beach renourishment include offshore borrow areas, upland sand sources and aragonite (or other calcium carbonate sands) from the Bahama Bank. The location of identified hardground areas have been taken into consideration by scaling back recommended project footprints and carefully locating nearshore berms to reduce and/or avoid associated impacts to hardground resources. The recommended plans are discussed in attachment 1.

COAST OF FLORIDA STUDY LOCATION MAP

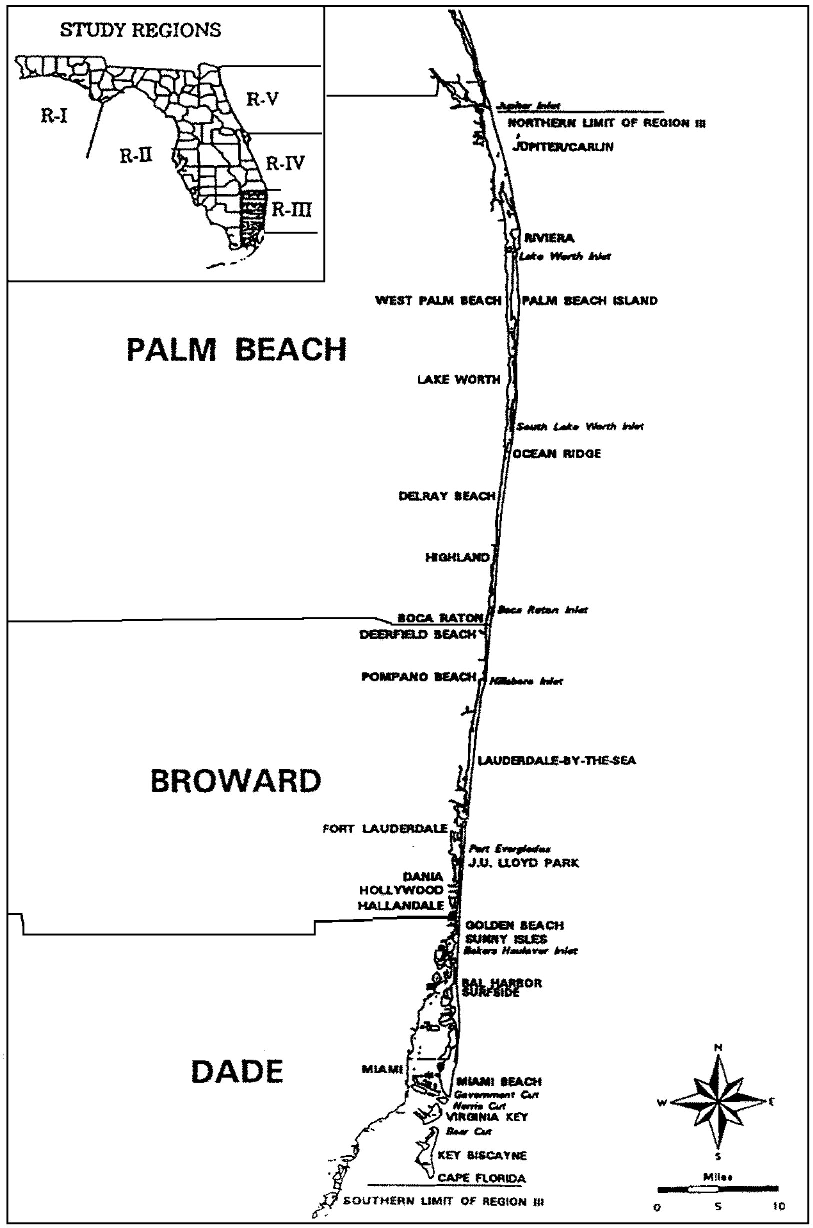

Figure 1

RECOMMENDED PLAN

PALM BEACH COUNTY

233. Recommend that the project for Palm Beach County, Florida from Martin County Line to Lake Worth Inlet and South Lake Worth Inlet to Broward County Line, authorized by the River and Harbor Act of 1962 (PL 87-874), be modified and herein after called the Palm Beach County, Florida Shore Protection Project. The following paragraphs describe components of the recommended project segments.

Jupiter Inlet to Lake Worth Inlet Project Segment

234. Jupiter/Carlin. This existing 1.1 mile beach restoration and periodic nourishment project component is located between DEP monuments R-13 and R-19. The project consists of a beach restoration with a seven year nourishment interval. Initial construction of this project was completed during April 1995. Extension of Federal participation from 10 years to the economic life of the project is recommended. Nearshore berms are not feasible in association with this project area due to the presence of nearshore hardgrounds.

235. Ocean Cay/Juno. This 2.75 mile project component is currently authorized for periodic nourishment as needed and justified. The recommended modification includes adding initial restoration by construction of a design beach with a 55 foot berm, and periodic nourishment between DEP monuments R-27 and R-41. The renourishment interval is seven years. The equilibrium toe of fill, including initial fill plus advance nourishment, is 300 feet. Mitigation for approximately 1.7 acres of hardground impact may be necessary in association with this project component. A nearshore berm site, away from potential hardground impact, has also been identified for use as an alternative maintenance dredged material disposal site. Extension of Federal participation from 10 years to the economic life of this project component is also recommended.

Lake Worth Inlet to South Lake Worth Inlet Project Segment:

236. Recommend that the project for Palm Beach County, Florida for Lake Worth Inlet to South Lake Worth Inlet (Palm Beach Island) authorized in 1958 (PL 85-500) be deauthorized. The following project components for Palm Beach Island would be added as project modifications to the Palm Beach County, Florida (1962) project. Extension of Federal participation from 10 years to the economic life of the project is also recommended for each project component.

237. Lake Worth Inlet. The recommended plan for Lake Worth Inlet requires the construction of a new fixed sand transfer plant to be located north of the inlet with three discharge points located along the dry beach 750, 1,250 and 1,750 feet south of the south jetty on Palm Beach Island. This system would be designed for a target bypassing rate of about 160,000 cubic yards per year to the south, across the inlet, through a 12-in pipeline.

238. The recommended plan for the sand bypassing plant would include:

a. A deposition area north of the north jetty,

b. An array of jet pumps suspended from a pier oriented perpendicular to the shoreline, or a single jet pump deployed by a crane from the north jetty,

c. A clear water pump and pipeline providing water to the jet pumps,

d. An on shore pumphouse containing the clear water pump and a booster pump for transferring the dredged material past the inlet,

e. A slurry pit to ensure the proper ratio of solids to water,

f. An drilled tunneled pipeline under the inlet from north of the north jetty to the south side of the south jetty, and

g. All associated pipe, valves, instruments, and controls required for operation of the system, including three remote controlled discharge valves located within the first 2,250 feet south of the south jetty.

The detailed sand transfer plant design would be determined within a Feature Design Memorandum (FDM) to be prepared during PED.

239. North-end Palm Beach Island. The 1.95 mile beach restoration and periodic nourishment project component located between DEP monuments R-76 and R-85 is authorized (1958), but not constructed. The optimal berm width is 10 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 100,000 cubic yards with a 190 foot toe of fill. The recommended renourishment interval is 4 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 281 feet with a total volume of 239,400 cubic yards. Mitigation for approximately 18 acres of hardground impact may be necessary in association with this project segment. Nearshore berms are not feasible in association with this project component due to the presence of nearshore hardgrounds.

240. Palm Beach Island (Mid-town). The 3.1 mile beach restoration and periodic nourishment project component located between DEP monuments R-91 and R-105 is authorized (1958), but not constructed. The optimal berm width is 25 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 568,400 cubic yards with a 390

foot toe of fill. The recommended renourishment interval is 4 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment is 455 feet with a total volume of 1,025,7800 cubic yards. Mitigation for approximately 3.65 acres of hardground impact may be necessary in association with this project component. Three potential nearshore berm sites have been identified for use as an alternative maintenance dredged material disposal site for the Federal navigation project at Palm Beach Harbor.

241. South-end Palm Beach Island. This 3.25 mile beach restoration and periodic nourishment project component located between DEP monuments R-116 and R-132 is authorized (1958), but not constructed. The optimal berm width is 35 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 248,900 cubic yards with a 350 foot toe of fill. The recommended renourishment interval is 4 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 432 feet with a total volume of 674,500 cubic yards. Mitigation for approximately 5.4 acres of hardground may be necessary in association with this project component.

South Lake Worth Inlet to Boca Raton Inlet Segment

242. South Lake Worth Inlet. The recommended plan for South Lake Worth Inlet requires the construction, operation and maintenance of a new sand transfer plant to be located north of the inlet with one discharge point located approximately 2,000 feet south of the south jetty. This system would be designed for a target bypassing rate of about 120,000 cubic yards per year. The design would be similar to the Lake Worth Inlet sand transfer plant and would similarly be determined within a Feature Design Memorandum (FDM) during PED studies.

243. Ocean Ridge. The 1.35 mile beach restoration and periodic nourishment project component located between DEP monuments R-152 and R-159 is authorized (1962), but not constructed. This project is scheduled for construction by Palm Beach County during 1996. The optimal berm width is 60 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial design volume is 770,000 cubic yards and includes 8 years of advance nourishment. The annual advance nourishment is 62,600 cubic yards. Two nearshore berm sites, however, have been recommended as potential dredged material disposal sites. Extension of federal participation from 10 years to 50 years is recommended.

244. Delray Beach. The recommended 2.7 mile beach restoration and periodic nourishment project component located between DEP monuments R-175 and R-188 is authorized and constructed. This project is recommended for modification with an additional 20 feet optimal berm width at elevation +9.0 feet NGVD and slopes of 1:20 berm to MLW and 1:30 from MLW to existing bottom. The recommended additional design volume is 155,300 cubic yards with a 290 foot equilibrium toe of fill. No hardgrounds exist in the vicinity of this project so no mitigation will be required. Although this project component is a considerable distance from either inlet, an extensive nearshore berm site offshore of this project componet is recommended as a potential dredged material disposal site. The Delray project has been extended to 50 years of Federal participation by Assistant Secretary of Army (Civil Works) under Section 934.

245. Highland Beach. The 3.4 mile beach restoration and periodic nourishment project component located between DEP monuments R-188 and R-205 is a modification to the authorized (1962) periodic nourishment project. It would fill in a gap between two authorized projects for lessening end losses. The optimal berm width of this project component is 120 feet at elevation +9.0 feet NGVD, and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 1,017,450 cubic yards with a 350 foot toe of fill. The recommended renourishment interval is 7 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 450 feet with a total volume of 1,900,430 cubic yards. No hardground mitigation has been identified for this project component. One nearshore berm site has been identified offshore of this

project coastline. Extension of Federal participation from 10 years to 50 years is recommended.

246. Boca Raton. The 1.65 mile beach restoration and periodic nourishment project component located between DEP monuments R-205 and R-213 is authorized and constructed. Extension of Federal participation from 10 years to 50 years is recommended. Another recommended modification to this project component is a nearshore berm site as an alternative maintenance dredged material disposal site.

Other Palm Beach County Project Segment Alternatives.

247. As previously discussed, specific recommendations for the 1.9 miles of northern the Palm Beach County shoreline, north of Jupiter Inlet, will be addressed in the Region IV COFS study. In addition to the above specific project components, periodic nourishment as necessary and justified is an existing project feature for Palm Beach County, Florida. No modification of this project feature is recommended for the economic life of the project. Dune grassing, as necessary and justified is also recommended for the Palm Beach County shoreline as a cost effective project feature.

Boca Raton Inlet (Palm Beach County) to Hillsboro Inlet (Broward County) Segment

BROWARD COUNTY

248. Deerfield Beach/Hillsboro Beach (Segment I). The 4.4 mile beach restoration and periodic nourishment project segment located between DEP monuments R-1 and R-24 is authorized, but not constructed. The optimal berm width is 30 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 746,700 cubic yards with a 300 ft toe of fill. The recommended renourishment interval is 7 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 406 feet with a total volume of 1,055,820 cubic yards. Mitigation for approximately 4.65 acres of hardground may be necessary in association with this project segment. A nearshore berm dredged material disposal site has been identified and recommended offshore this project shoreline. It is also recommended that Federal participation in this project segment be extended from 10 years to the economic life of the project.

249. Hillsboro Inlet. Navigation improvements are being considered for the outer channel at this inlet to provide additional advanced maintenance for the entrance channel as part of the Hillsboro Inlet, Florida, Federal navigation project. Two alternatives are being evaluated. One alternative is as designed and contained within a permit request by the sponsor. The other is an alternative designed by Jacksonville District. The recommendations for this navigation project will be addressed in a

separate navigation report which will address related potential impacts to the adjacent shorelines.

Hillsboro Inlet to Port Everglades Inlet Segment (Segment II)

250. Pompano/Lauderdale-By-The-Sea. The 5.2 mile beach restoration and periodic nourishment project component located between DEP monuments R-24 and R-53 is authorized and constructed. This project is recommended for modification with an additional 35 feet optimal berm width at elevation +9.0 feet NGVD and slopes of 1:20 berm to MLW and 1:30 from MLW to existing bottom. The recommended additional design volume is 600,000 cubic yards with a resulting equilibrium toe of fill of 365 feet. Mitigation for approximately 12.25 acres of hardground may be necessary in association with this project segment modification. A nearshore berm dredged material disposal site has been identified and recommended off this project shoreline. Extension of Federal participation in this project segment from 10 years to the economic life of the project is also recommended.

251. Fort Lauderdale. This 4.0 mile project segment area located between DEP monuments R-53 to R-74 is authorized for periodic nourishment. A beach restoration and periodic nourishment project component modification is recommended. The recommended optimal berm width is 25 feet at elevation +9.0 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 466,700 cubic yards. The recommended renourishment interval is 6 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 500 ft with a total volume of 858,193 cubic yards. Federal participation to the 50 year economic life of this project component is recommended. Mitigation for approximately 18 acres of hardground impact may be necessary in association with this project component. Nearshore berms are not feasible in association with this project component due to the presence of nearshore hardgrounds.

Port Everglades Inlet (Broward County) to Bakers Haulover Inlet (Dade County)

Broward County (Segment III)

252. Segment III of the Broward County project includes two authorized beach restoration and periodic nourishment project sections, J. U. Lloyd and Hollywood/Hallandale. Extension of Federal participation to the 50 year economic life of these projects was approved by Assistant Secretary of Army (Civil Works) under Section 934 in September 1992.

253. J.U. Lloyd. The 2.3 mile beach restoration and periodic nourishment project component located between DEP monuments R-86 and R-98 is authorized and constructed. The optimal berm width in the re-analysis of this project remains at 100 feet at elevation +10 feet NGVD and slopes of 1:15 berm to MLW and 1:30 from

MLW to existing bottom. The design volume, including initial fill and advance nourishment is 1,032,000 cubic yards. The renourishment interval is 6 years. The only recommended modification to this project segment is a nearshore berm site as an alternative maintenance dredged material disposal site.

254. Hollywood/Hallandale. The 5.25 mile beach fill project located between DEP monuments R-101 and R-128 is authorized and constructed. This project is recommended for modification with an additional 50 feet optimal berm width at elevation +7.0 feet NGVD and slopes of 1:15 berm to MLW and 1:40 from MLW to existing bottom. The recommended additional design volume is 720,000 cubic yards resulting in a project equilibrium toe of fill of 230 feet. The renourishment interval is 6 years. No hardgrounds exist in the immediate vicinity of this project so no mitigation will be required. A nearshore berm dredged material disposal site has been identified offshore of this project segment.

255. Dania. This 0.6 mile reach of beach is presently authorized for periodic nourishment. A modification to a beach restoration and periodic nourishment project is recommended for this project segment component located between DEP monuments R-98 and R-101. Initial restoration of the beach at Dania would fill in the gap between J.U. Lloyd and Hollywood/Hallandale. Due to the small project length, the fill would be designed as a transition between these two all ready constructed projects and help reduce end losses in Segment III.

256. The optimal berm width transition between J. U. Lloyd and Hollywood/Hallandale is 125 feet, on the average (i.e., between 100 and 150 feet), with a transition berm height between elevation +10.0 feet and +7.0 NGVD and slopes of 1:15 berm to MLW and 1:40 from MLW to existing bottom. The initial design volume is 208,300 cubic yards. The recommended renourishment interval is 6 years. The distance to the equilibrium toe of fill, including initial fill plus advance nourishment, is 220 feet with a total volume of 460,840 cubic yards. Federal participation in the economic life of this transition project component is recommended.

Other Broward County Project Segments.

257. In addition to the above specific project segments, periodic nourishment as necessary and justified is an existing project feature to the Broward County, Florida project. No change in this project feature is recommended at this time. Dune grassing, as necessary and justified is also recommended for the Broward County shoreline as a cost effective project feature.

DADE COUNTY

258. Golden Beach. It is recommended that the Dade County, Florida, Beach Erosion Control and Hurricane Protection Project be modified to include initial restoration and periodic nourishment for the 1.2 mile shoreline located between DEP monuments R-1 and R-7 in Dade County. This project component would fill in a gap between the Dade County and Broward County authorized projects, decreasing project end losses.

259. The optimal berm width in the analysis of this project is 100 feet at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The initial project design volume is 311,000 cubic yards with a 260 foot toe of fill. The recommended renourishment interval is 6 years. The distance to the recommended equilibrium toe of fill, including initial fill plus advance nourishment is 832 feet with a total volume of 534,660 cubic yards. Mitigation for approximately 5.25 acres of hardground impact may be necessary in association with this project segment. One nearshore berm site has been identified as an alternative maintenance dredged material disposal site.

260. Sunny Isles. The 2.65 mile beach fill project segment component located between DEP monuments R-7 and R-20 is authorized and constructed. This segment of the Dade County, Florida project is recommended for modification with an additional 20 feet optimal berm width at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom. The recommended additional design volume is 146,700 cubic yards with an additional 200 foot toe of fill extension. No hardgrounds exist in the vicinity of this project so no mitigation will be required. One nearshore berm site has been identified as an alternative maintenance dredged material disposal site.

Bakers Haulover Inlet to Government Cut:

261. Bal Harbour, Surfside, Miami Beach. The 9.3 mile beach fill project segment located between DEP monuments R-27 and R-74 is authorized and constructed. The only recommended modifications to this project segment are the addition of four nearshore berm sites that have been identified as an alternative maintenance dredged material disposal sites.

262. Government Cut. As identified in a previous DM, a sand tightening of Government Cut has been recommended. This sand tightening will help reduce end losses to the southern portion of the Miami Beach project segment and further reduce Government Cut maintenance dredging requirements. The sand tightening project will be undertaken as a separate project modification.

Project Segments South of Government Cut:

263. Virginia Key/Northern Key Biscayne. Shore protection of Virginia Key and northern Key Biscayne was authorized by the River and Harbor Act of 1962 (PL 87-874). Construction of the 1.8 mile Virginia Key shoreline and 1.9 mile northern Key Biscayne shoreline was completed in 1969. The Virginia Key shoreline was renourished in 1972 and 13 groins were also constructed. This project was deauthorized in 1990. As documented in the 1992 Rehabilitation Report following Hurricane Andrew, in August 1992, the Virginia Key project was found to be performing well to date. No project segment modification is recommended for Virginia Key at this time.

264. Key Biscayne. The 2.3 mile beach fill project located between DEP monuments R-101 and R-113 was initially constructed in 1985 under the authority of Section 103 of the 1962 River and Harbor Act. Nourishment for 50 years was authorized, however, the Federal limit of $1,000,000 under Section 103 has been met. It is recommended that the Dade County project be modified to incorporate this project segment so that Federal participation in periodic nourishment can be continued through the economic life of this project segment. An additional optimal berm width of 10 feet at elevation +8.2 feet NGVD and slopes of 1:10 berm to MLW and 1:30 from MLW to existing bottom is recommended. The additional project design volume is 106,660 cubic yards. The recommended renourishment interval is 7 years.

Other Dade County Project Segments:

265. In addition to the above specific project segment modifications, periodic nourishment as necessary and justified is recommended for all Atlantic Ocean shorelines within Dade County for the economic life of each project segment. Dune grassing, as necessary and justified is also recommended for the Dade County shoreline as a cost effective project feature.

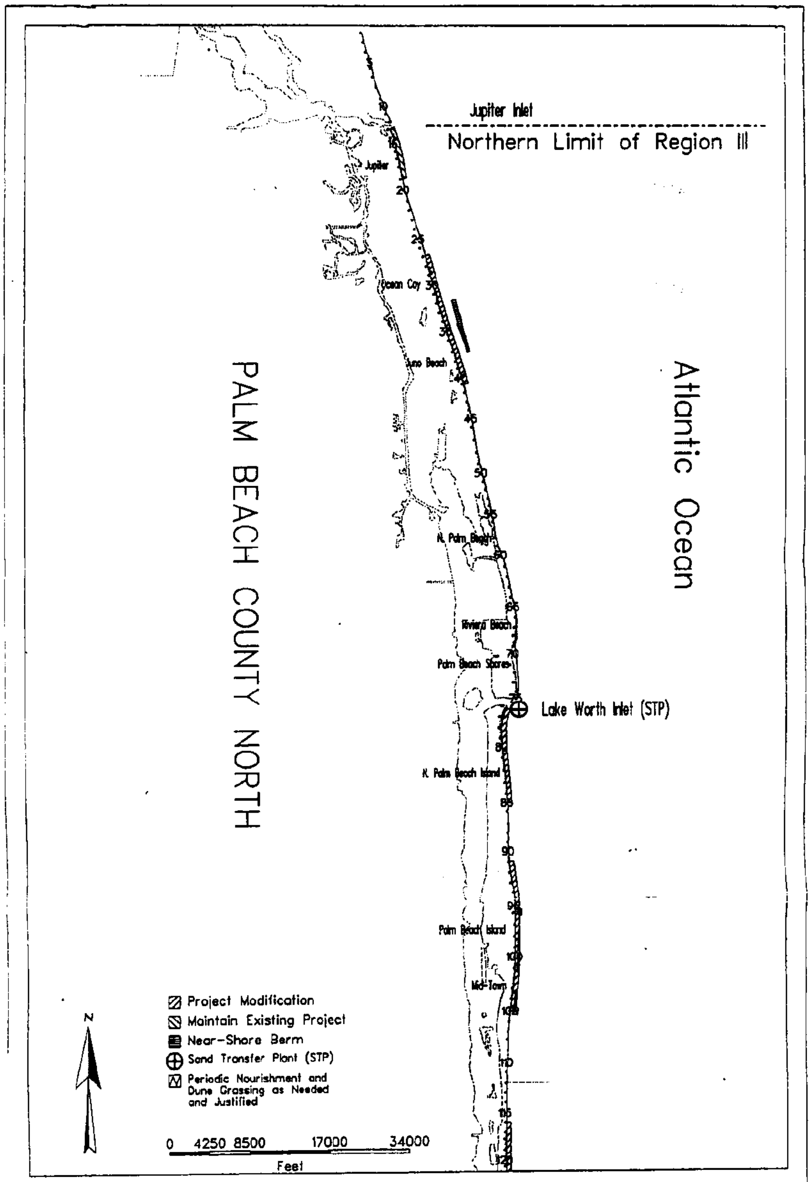

Figure 2. Palm Beach County Project Alternatives, North

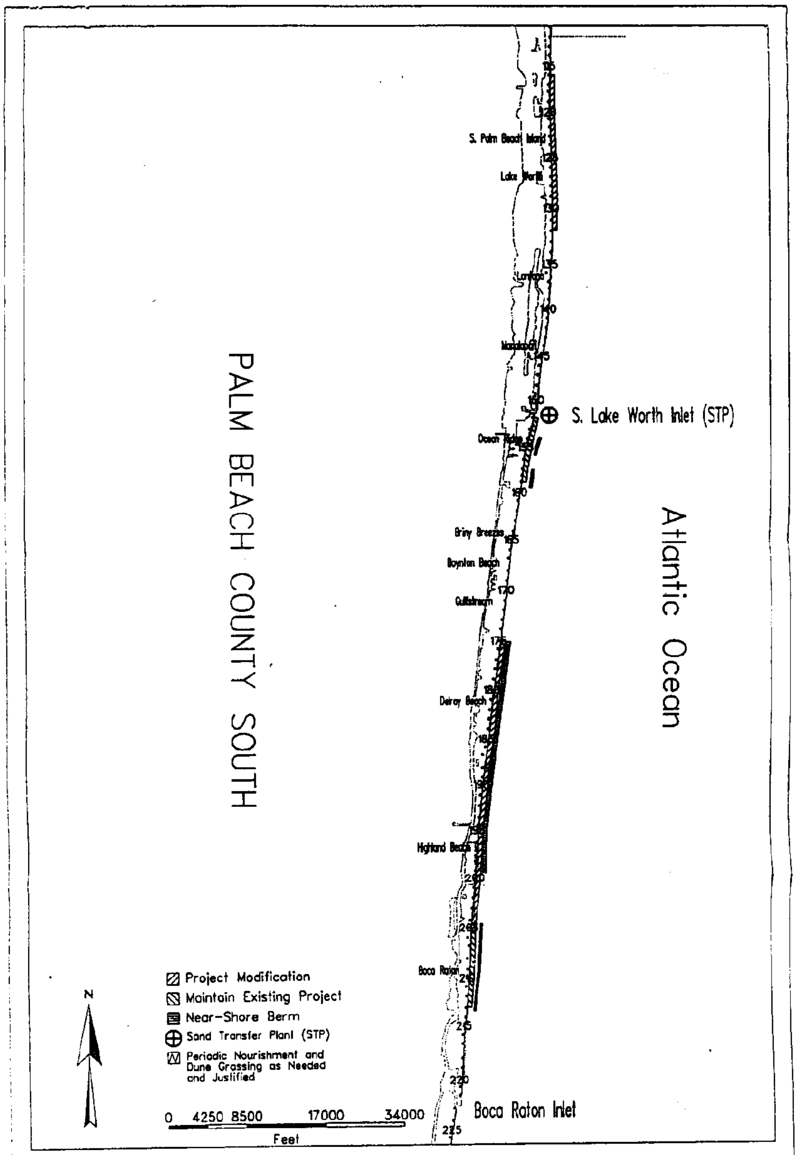

Figure 3. Palm Beach County Project Alternatives, South

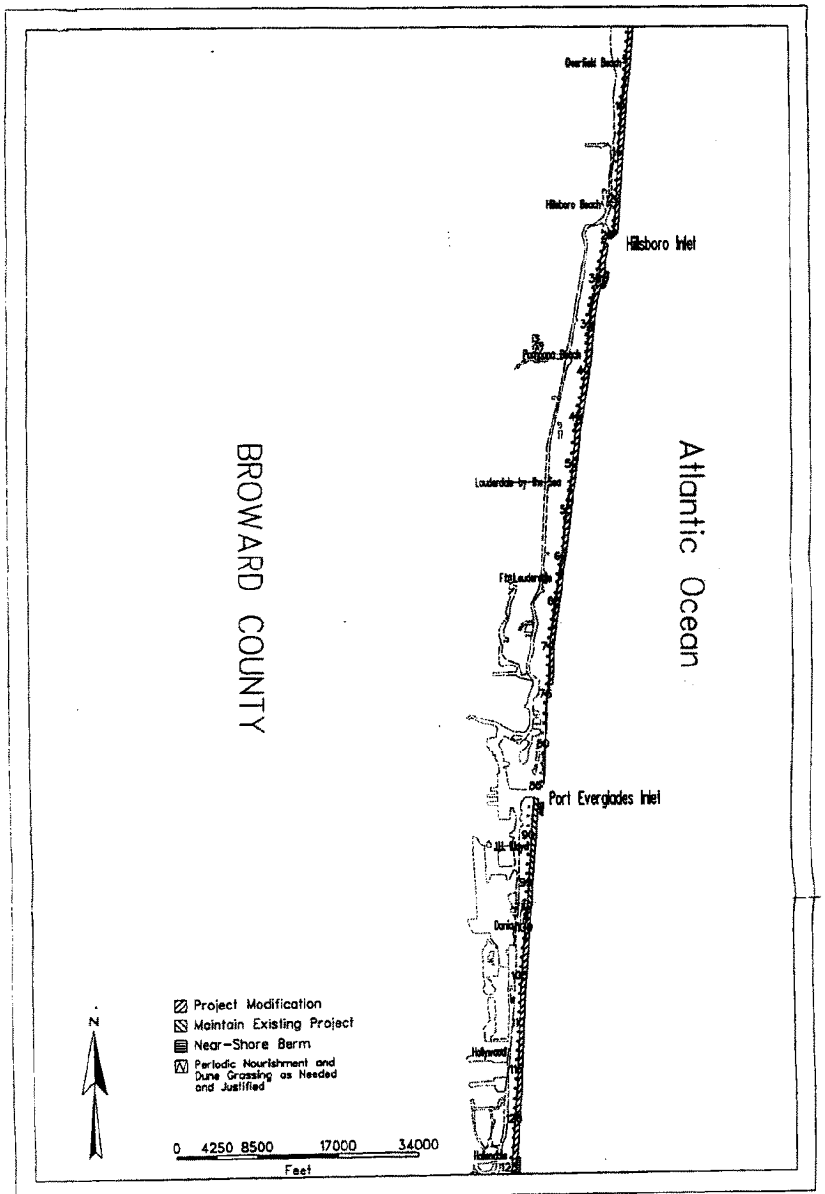

Figure 4 Broward County Project Alternatives

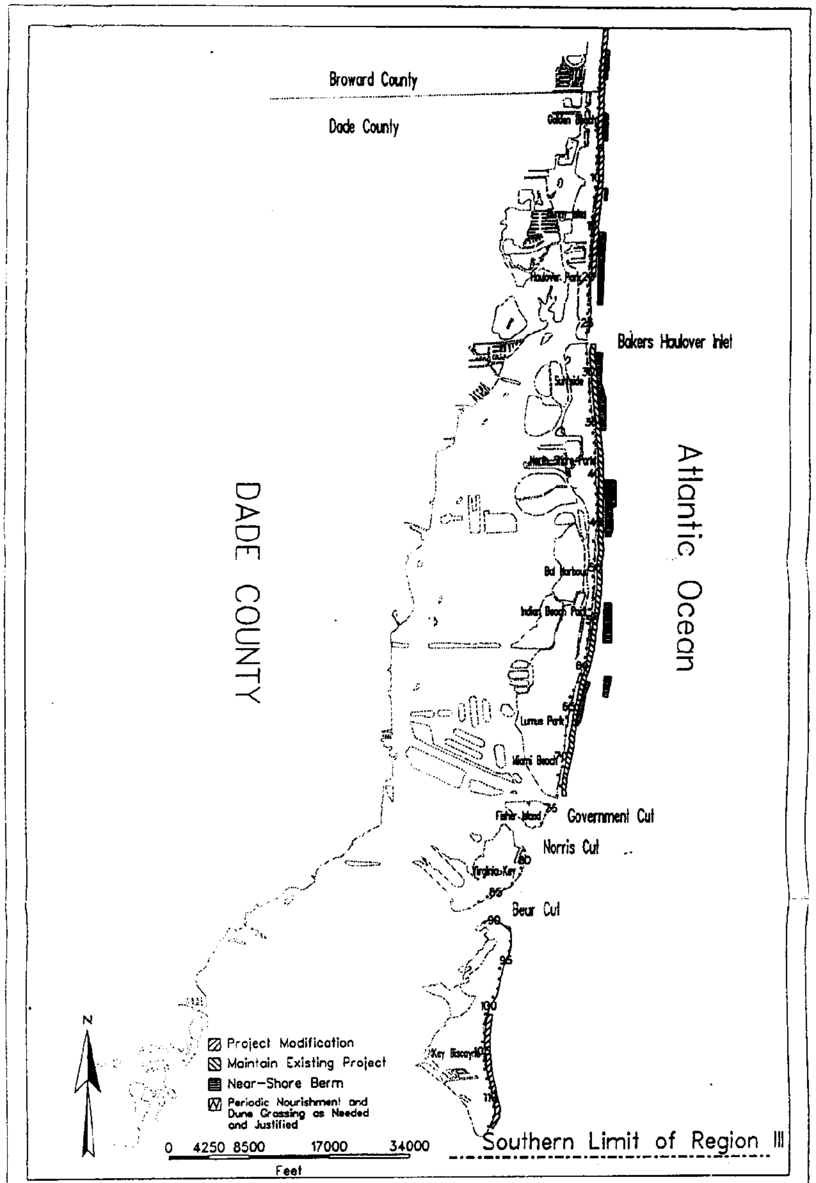

Figure 5. Dade County Project Alternatives

October 5, 1995

Planning Division
Environmental Branch

Mr. Craig Johnson
Field Supervisor
U.S. Fish and Wildlife Service
Post Office Box 2676
Vero Beach, Florida 32961-2676

Dear Mr. Johnson:

This is in reference to the Coast of Florida Erosion and Storm Effects Study.

Enclosed is the Biological Assessment pursuant to Section 7(a) of the Endangered Species Act concerning potential impacts to sea turtles. The U.S. Army Corps of Engineers has determined that the planned actions may affect sea turtle nesting. Therefore, we are requesting that formal consultation with the Service be initiated to address potential impacts the project may have on sea turtles.

U.S. Fish & Wildlife

Please provide your Biological Opinion as specified in Section 7(b)(1) of the Endangered Species Act. If you have any questions or need any further information, you can contact Mr. Mike Dupes at 904-232-1689.

Sincerely,

A. J. Salem
Chief, Planning Division

Enclosure

ENDANGERED SPECIES ACT
BIOLOGICAL ASSESSMENT
COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY
REGION III

1. PROJECT AUTHORITY: The Coast of Florida Erosion and Storm Effects Study (COFS) is being conducted in response to Section 104, Public Law (PL) 98-360, dated July 16, 1984, and a resolution date August 8, 1984, by the Committee on Public Works and Transportation, of the U.S. House of Representatives.

2. LOCATION: The study area is located along the Atlantic Ocean shoreline of Palm Beach, Broward, and Dade Counties on the lower southeast coast of Florida (Figure 1). Palm Beach County is the northernmost county in the study area followed by Broward County and then Dade County at the southern end. The northern limit is Jupiter Inlet and is about 80 miles north of Miami Beach. The southern limit of the study area is the southern tip of Key Biscayne in Dade County. The study area comprises approximately 88 miles of Atlantic Ocean shoreline.

3. DESCRIPTION OF THE PROPOSED ACTION: The COFS is a multi-year, phased regional feasibility study examining the entire developed east coast ocean shoreline and west coast gulf shoreline. The objective of the study is to develop a comprehensive understanding of the coastal processes and associated environmental resources to help in the development of enhanced shore protection projects while reducing environmental impacts. The current region being studied (Region III), which includes Dade, Broward and Palm Beach Counties, is nearing completion. Alternative recommendations for 21 project segment modifications have been identified through the COFS. These modifications include initial beach restoration for four new sites, (Fort Lauderdale, Highland Beach, Dania and Golden Beach) and improvements at two existing sand transfer plants (Lake Worth Inlet and South Lake Worth Inlet) in addition to modifications at other existing authorized beach nourishment sites. New nearshore berm disposal sites have also been identified as project components adjacent to several project locations. Alternative sand sources for beach renourishment include offshore borrow areas, upland sand sources and aragonite (or other calcium carbonate sands) from the Bahama Bank. The location of identified hardground areas have been taken into consideration by scaling back recommended project footprints and carefully locating nearshore berms to reduce and/or avoid associated impacts to hardground resources. The recommended plans are discussed in the Draft Feasibility Report for the study, dated May 1995. A preliminary review copy of this report, which includes a Draft Environmental Impact Statement has been provided to the U.S. Fish and Wildlife Service Field Office in Vero Beach, Florida.

4. REFERENCES: Several Biological Assessments and Biological Opinions have been prepared for previous shore protection projects in the Region III study area. These documents are listed in the reference section and are incorporated into this Biological Assessment by reference.

5. LISTED SPECIES WHICH MAY BE AFFECTED: Listed species which may occur in the vicinity of the study area and are under the jurisdiction of the U.S. Fish and Wildlife Service are: loggerhead sea turtle (*Caretta caretta*, T), green sea turtle (*Chelonia mydas*, E), leatherback sea turtle (*Dermochelys coriacea*, E), hawksbill sea turtle (*Eretmochelys imbricata*, E), and the West Indian manatee (*Trichecus manatus*, E).

6. DISCUSSION OF POTENTIAL IMPACTS TO LISTED SPECIES:

The potential impacts to sea turtles and manatees that can be associated with beach nourishment projects have been discussed at length in the Biological Assessments and Biological Opinions referenced above and are incorporated here by reference. The following addresses potential effects to sea turtles if calcium carbonate sand from the Bahamas is used.

Few beaches in Florida have been nourished with sand imported from the Bahamas. Fisher Island, in Miami, Florida was renourished with commercially mined aragonite in 1991. The impact of nourishment in relation to sea turtle nesting on the beach at Fisher Island has been part of a three year study by the Sea Turtle Laboratory at the Rosenstiel School of Marine and Atmospheric Science. There were a total of six natural[1] nests laid in 1991 on Fisher Island beach and a total of 15 in 1992 (Lutz et al. 1991, 1992).

It has been noted that turtles nest in various types of sands, both calcareous types (including shell and aragonite) and silica types (quartz sands). Quartz sand has a hardness of 7.0 on the Mohs scale, while aragonite ranges near 4.0 (Campbell et al. 1984). The aragonite sand is physically spherical to ellipsoidal in shape and is more dense than native sand. The mean grain size ranges from 0.25 mm to 0.29 mm and is moderately sorted (U. S. Army Corps of Engineers 1995). The increased density and shape of the aragonite tend to make it behave as a larger grain sized material. Aragonite sand has a lower silt/clay content than natural offshore borrow sources. Aragonite would tend to be more stable than native Florida sands because of its spherical shape and higher specific gravity. Aragonite has essentially no material finer than 200 microns and are well sorted with peaks at 300 to 500 microns (Wanless 1983). Because of the small amount of fines, the use of aragonite in beach nourishment is expected to reduce turbidity-related impacts, both in the nearshore zone and near the offshore reefs (Coastal Planning & Engineering 1994).

In addition to the monitoring of the natural nests in the Fisher Island Study, nests from Juno Beach, Jupiter, Florida, were relocated and monitored at two hatcheries, one filled with aragonite and the other filled with Florida sand. The hatcheries were located

[1] "Natural" nests refers to nests that were left on the beach undisturbed, i.e. unrelocated nests.

approximately 75 feet from the shore on the east side of the renourished Fisher Island beach (Lutz et al. 1991). First year results revealed that aragonite sand on average is 2°C cooler than Florida silicate, significantly extending incubation times by 5 days and quite possibly altering natural sex ratios (Lutz et al. 1991). This temperature difference was also noted in the 1992 study. The Fisher Island Study showed no significant differences in hatchling size or hatching success of hatchlings between aragonite and Florida sand nests. The 1992 study revealed similar results as the 1991 study.

While sea turtles do successfully nest in aragonite sands, it is possible that the rate of success (portion of nests to total crawls) would be different from that in native sand. Because of the cooler temperatures found in aragonite, this may affect incubation time and could alter hatchling sex ratios. A 2°C change may lower the temperature below the pivotal point, therefore potentially causing more males than originally expected (Mrosovsky and Yntema 1980). This aspect should be studied carefully in the future. The U.S. Army Corps of Engineers is developing a study to determine the effects of using calcium carbonate sands from the Bahamas on Florida beaches. The study would include the construction of a test beach with Bahamian sand to monitor the physical properties and effects, as well as, effects on sea turtles and other environmental effects. The study is being coordinated with the State of Florida Department of Environmental Protection (FDEP) and the U.S. Fish and Wildlife Service (USFWS).

A test hatchery has been installed by Dade County in cooperation with the Corps Waterways Experiment Station. The purpose of the test hatchery is to compare physical characteristics, hatching success, and sex ratios for nests in aragonite and mixed sands. Results from the 1995 nesting season should be available around February 1996.

Although Bahamian sand is being considered as a potential source of sand for the Coast of Florida Study, this material will not be used until the appropriate studies have been completed and its use approved by the State and the USFWS.

7. EFFORTS TO ELIMINATE POTENTIAL IMPACTS:

Efforts to eliminate of significantly reduce the potential impacts associated with beach nourishment activities will be addressed by implementing the following actions:

a. Construction activities will be kept under surveillance, management, and control to minimize interference with, disturbance of, or damage to wildlife resources. Prior to the commencement of construction the contractor will be required to instruct all personnel associated with the project that endangered species could be in the area, the need to avoid collisions with them, and the civil and criminal penalties for harming, harassing or killing them.

b. Construction access and staging areas along the beach will be identified in the contract plans and specifications. Contractor vehicles, construction equipment and storage facilities will be required to stay within the identified construction area.

c. Precautions will be taken during construction activities to insure the safety of the manatee. To insure the contractor and his personnel are aware of the potential presence of the manatee in the project area, their endangered status, and the need for precautionary measures, the contract specifications will include the standard protection clauses concerning manatees. All small vessels associated with the project will be required to operate at "no wake" speeds at all times while in shallow water, or channels, where the draft of the vessel provides less than three feet clearance from the bottom. Boats used to transport personnel shall be shallow draft vessels, preferably of the light-displacement category, where navigational safety permits. Vessels transporting personnel between the landing and any work boat shall follow routes of deep water to the extent possible. The contractor shall be held responsible for any manatee harmed, harassed, or killed as a result of the construction of the project. If a manatee is sighted within a hundred yards of the dredging area, appropriate safeguards will be taken, including suspension of dredging, if necessary, to avoid injury to manatees.

d. Efforts to eliminate or significantly reduce potential impacts to sea turtles will be addressed by the following:

(1) If construction occurs during any part of the sea turtle nesting season, a nest survey and relocation program will be implemented within the identified construction area. Nest relocation activities shall begin 65 days prior to construction activities which occur within the nesting, or by the first day of the season, whichever is later. In past USFWS Biological Opinions (within the Region III study area), the relocation timing and requirements have differed depending on the nesting density of the beach, recreational use and maintenance operations on the beach and existing relocation plans. The timing and requirements for relocation for each renourishment and/or construction activity will be determined during separate Section 7 consultations with the USFWS.

(2) Nest surveys and relocations will be conducted by personnel with prior experience and training in nest survey and relocation procedures, and with a valid Florida Department of Environmental Protection (FDEP) permit. Nests will be relocated between sunrise and 10 a.m. each day. All nests located and determined to be endangered by construction activities will be relocated to a nearby self release hatchery or a safer location on the beach.

(3) Immediately following completion of beach nourishment, cone penetrometer readings will be taken on the beach as previously described. Should the beach be impenetrable or the average cone index unit (cpu) exceed 500 cpu, the beach will be tilled to a depth of 36 inches (90 cm).

(4) The nourished beach will be monitored for escarpment formation. If an escarpment develops which exceeds 18 inches (45 cm) in height extends for more than 100

feet (30 m) and exceeds 500 cpu, it will be graded to a more accessible slope prior to the next turtle nesting season.

(5) If construction occurs during the sea turtle nesting season, measures will be taken to reduce beach lighting during nighttime operations. This will include eliminating lighting to an amount necessary for safe operation sand safety of personnel, and shall incorporate reduced wattage, downlights, and/or screens to minimize illumination of the beach and nearshore waters. Lighting on offshore equipment, including the dredge, shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all Coast Guard and OSHA requirements. Shielded low pressure sodium vapor lights is recommended for all lights on the beach or offshore equipment that cannot be eliminated.

e. Any incident involving the death or injury of any listed threatened or endangered species described in this Biological Assessment shall be immediately reported to the U.S. Army Corps of Engineers (Jacksonville) and the U.S. Fish and Wildlife Service (Vero Beach).

8. EFFECT DETERMINATION: Because of the nature of the work and the precautions to be taken as described in the previous section, the U.S. Army Corps of Engineers has determined that the proposed action will have no effect on the manatee. Because of the potential effects associated with nesting sea turtles, sea turtle nests, and hatchlings, we have determined that the proposed action may affect sea turtles.

REFERENCES

Previous Biological Assessments prepared by the U. S. Army Corps of Engineers.

Dade County Shore Protection Project, Sunny Isles and Miami Beach Segments - April 23, 1993.

Dade County Shore Protection Project, Surfside and South Miami Beach Segments - December 21, 1993.

Broward County Shore Protection Study, Segment II, Section 934 Study - July 26, 1991.

Broward County Shore Protection Project, Hollywood/Hallandale Renourishment - February 8, 1990.

Palm Beach County Shore Protection Project, Ocean Ridge - January 21, 1994.

Previous Biological Opinions Prepared by the U.S. Fish and Wildlife Service.

Dade County Shore Protection Project, Sunny Isles and Miami Beach Segments - August 11, 1993, amended July 28, 1994.

Dade County Shore Protection Project, Surfside and South Miami Beach Segments - April 15, 1994.

Broward County Shore Protection Project, Hollywood/Hallandale Renourishment - March 20, 1990.

Palm Beach County Shore Protection Project, Delray Beach - August 3, 1990.

Palm Beach County Shore Protection Project, Jupiter/Carlin - April 2, 1991.

Palm Beach County Shore Protection Project, Ocean Ridge - May 26, 1994.

Other References.

Campbell, Thomas J., P.E., Robert G. Dean, Sc.D., Norman H. Beumel, and R. Harvey Sasso. 1984. Engineering and economic evaluation of aragonite sand vs offshore borrow material. 24 pp.

Coastal Planning & Engineering, Inc. 1994. Feasibility Study for the use of aragonite sand for beach renourishment in Broward County. 57 pp.

Lutz, Peter L., Alexis A. Schulman, and Sarah L. Shaw. 1991. Fisher Island sea turtle project annual report 1991. 51 pp.

Lutz, Peter L., Alexis A. Schulman, and Sarah L. Shaw. 1992. Fisher Island sea turtle project annual report 1992. 49 pp.

Mrosovsky, N. and C. L. Yntema. 1980. Temperature dependence of sexual differentiation in sea turtles: implications for conservation practices. Biological Conservation 18:271-280.

U.S. Army Corps of Engineers. 1995. Environmental Assessment for the second periodic nourishment of Sunny Isles and Miami Beach Segments, Beach Erosion Control and Hurricane Protection Project, Dade County, Florida. 74 pp.

Wanless, Harold R. October 18, 1993. Comparative grain size analyses of an oolitic sand and sands from potential borrow areas in southeast Florida. Arthur V. Strock & Associates, Inc. 19 pp.

September 12, 1995

Planning Division
Environmental Branch

Mr. David Ferrell
U.S. Fish and Wildlife Service
Post Office Box 2676
Vero Beach, Florida 32961-2676

Dear Mr. Ferrell:

I have enclosed a copy of the Scope of Work (SOW) for field investigations needed by your office to prepare a Fish and Wildlife Coordination Report for the Coast of Florida Erosion and Storm Effects Study, Region III. We are currently negotiating this SOW with our contractor.

We plan to complete negotiations and issue a Notice to Proceed (NTP) by the end of this month. A final report is expected within 105 days of the NTP (see paragraph 8 of the SOW).

If you have any questions or comments, please contact Mr. Mike Dupes of my staff at 904-232-1689 or fax to 904-232-3442.

Sincerely,

A. J. Salem
Chief, Planning Division

Enclosures

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

Colonel James H. Simms, USA AUG 25 1995
Acting Commander
South Atlantic Division, Corps of Engineers
Room 313, 77 Forsyth St., S.W.
Atlanta, Georgia 30335-6801

Dear Colonel Simms:

Enclosed is the biological opinion that concludes formal Endangered Species Act Section 7 consultation on hopper dredging of channels and beach nourishment activities in the southeastern United States from North Carolina through Florida East Coast. The National Marine Fisheries Service (NMFS) concurs with COE findings that dredging windows and further development of the rigid draghead deflector reduces the effects of hopper dredging on sea turtle species, while allowing dredging to continue. As you know, this consultation supersedes a previous regional opinion issued to the COE South Atlantic Division (SAD) on channel dredging in which NMFS found that continued hopper dredging activity in southeast channels along the Atlantic Coast was likely to jeopardize the continued existence of the Kemp's ridley sea turtle (November 25, 1991). The reasonable and prudent alternative issued with the 1991 opinion included the prohibition of hopper dredging in the Canaveral channel, seasonal restrictions which allowed hopper dredging from December through March in channels from North Carolina through Canaveral, or use of other dredges in all southeastern U.S. channels. Since the implementation of this alternative in the winter of 1991, only 14 takes of sea turtles, including three live turtles, have been documented on board hopper dredges in channels along the southeastern U.S. Atlantic Coast.

The Incidental Take Statement, reasonable and prudent measures, and conservation recommendations listed in the enclosed opinion have been discussed with the COE's SAD staff. Of note, hopper dredging windows are modified from the windows established in 1991 and observer requirements have been expanded to incorporate beach nourishment activities. The continued deployment of observers, and participation in the Right Whale Early Warning System, are also listed requirements within this biological opinion. Please note that the authorization for this incidental take expires August 5, 2000. In addition, consultation must be reinitiated when 75% of the authorized incidental take is reached.

Hopper dredging in Cape Canaveral, Florida is not considered under this consultation since turtle concentrations in Canaveral remain high year-round. Projects requiring the use of a hopper dredge in Canaveral will require further, project-specific, consultation.

Much of the new information considered in the enclosed opinion was the result of extensive research efforts recently concluded by COE in six southeast channels: Morehead City Harbor entrance channel, Charleston Harbor entrance channel, Savannah Harbor entrance channel, Brunswick Harbor entrance channel, Fernandina Harbor-St. Marys River entrance channel, and the Canaveral Harbor entrance channel. The results of this research support some modifications to previous seasonal restrictions for hopper dredging in these channels. Additionally, a draghead deflector has been developed that has shown promising results during preliminary tests and field application.

Through an extensive sea turtle research program and participation on the Right Whale Recovery Plan Implementation Team, the COE's SAD has become a leader among Federal action agencies in the southeast region in endangered species research and conservation. We look forward to continued cooperative efforts with your division.

Sincerely,

William W. Fox, Jr., Ph.D.
Director
Office of Protected Resources

Enclosure

cc: ACOE Charleston District, Col. George Hazel
Wilmington District, Col. Robert Sperperg
Savannah District, William Bailey
Jacksonville District, A. J. Salem
F/SE013 - Oravetz

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

Endangered Species Act - Section 7 Consultation

Biological Opinion

Agency: U.S. Army Corps of Engineers, South Atlantic Division

Activity: Hopper dredging of channels and beach nourishment activities in the Southeastern United States from North Carolina through Florida East Coast

Consultation Conducted By: National Marine Fisheries Service, Southeast Regional Office

Date Issued: August 25, 1995

BACKGROUND

The U.S. Army Corps of Engineers (COE) has primary responsibility for maintaining navigational channels in U.S. waters. To accomplish this task, dredging is periodically required. A variety of dredge types and techniques are employed on a channel-specific basis, dependent upon the characteristics of channels, availability of disposal sites, local environmental regulations, types of material to be removed, proposed timing of the dredging, etc. In the southeastern United States, at least three types of dredges (hopper dredges, clamshell dredges, and pipeline dredges) are commonly used.

In addition, Congress has mandated that the COE provide periodic beach nourishment to certain beaches in the southeastern U.S. that suffer severe erosion rates. Nourishment activities consist of dredging coarse high-quality sand from offshore borrow areas then pumping the material onshore.

A formal consultation conducted on dredging and beach nourishment operations from North Carolina through Cape Canaveral, Florida, in 1991, and incorporated by reference, concluded that clamshell and pipeline dredges were not likely to adversely affect listed species. There is no new information to change the basis for that finding. Lethal takes of sea turtles by hopper dredges have been documented, however, and consultations on takes have been conducted since 1980.

Previous Consultations

Consultation on the effects of hopper dredging in the Canaveral ship channel was initiated in August 1978, after NMFS trawl surveys verified reports of high turtle abundance in the channel. On March 30, 1979, NMFS issued a biological opinion based on a threshold examination of the situation. This opinion concluded that insufficient information existed to determine whether or not dredging was likely to jeopardize the continued existence of sea turtles. Through agreement with the COE and the U.S. Navy, trawl surveys were implemented to further assess turtle abundance and distribution in the channel.

On January 22, 1980, the National Marine Fisheries Service (NMFS) issued a biological opinion concluding that "dredging may result in the loss of large numbers of loggerhead sea turtles but is not likely to result in jeopardizing either the loggerhead or Atlantic ridley sea turtle stocks." This opinion recommended that NMFS-approved observers be placed aboard hopper dredges in the Canaveral channel to monitor turtle take, and that dredging be restricted to the period of August 1 through November 1. No evidence of turtle take by hopper dredges existed at this point, but the potential for take was recognized.

A total of 71 turtle takes by hopper dredges were documented in the Canaveral channel over the period of July 11 through November 13, 1980. These takes were considered minimum estimates of mortality due to restrictions inherent in observing turtles within the dredged material. From 1980 through 1986, NMFS, the COE, and the U.S. Navy continued efforts to reduce or eliminate turtle take by hopper dredges in the Canaveral entrance channel. Efforts included attempts to scare turtles out of the channel, detect and capture turtles, remove and relocate turtles, and deflect turtles from the draghead. No acceptable means of eliminating the take of sea turtles by hopper dredges was identified, and take of sea turtles continued.

Trawl surveys of five east coast channels, conducted during 1981 and 1982 (Butler et al., 1987), indicated that these channels did not contain sea turtles at abundances approaching those observed in Canaveral. One or two turtles were collected in each of the surveyed channels, while hundreds were caught in the Canaveral channel. Because NMFS had no information to suggest that turtle takes in other channels was significant, additional channel surveys were not required, and the Canaveral hopper dredging project was treated as a unique problem.

In 1986, the U.S. Navy reinitiated Endangered Species Act (ESA) Section 7 consultation on Kings Bay, Georgia, channel dredging. The scope of the project involved widening and deepening existing channels and extension of the channel approximately 14 miles. The Navy proposed to implement sea turtle conservation measures including observer coverage, screening of the dredge, and a stand-by trawler to catch and remove turtles, if necessary. From July 1987 through December 1989, a total of 21 turtles were taken during hopper dredging operations in the Kings Bay project.

Turtle take by hopper dredges in Kings Bay resulted in major changes in NMFS policy on channel dredging. This was the first documented take of turtles by hopper dredges anywhere other than in the Canaveral channel. Additionally, while takes in Canaveral were confined to loggerhead turtles, Kings Bay takes included three endangered Kemp's ridley turtles and three endangered green turtles. NMFS began to consider the additive consequences of hopper dredging along the southeast coast.

The Jacksonville District COE and the COE Waterways Experiment Station jointly sponsored a May 11-12, 1988, "National Workshop on Methods to Minimize Dredging Impacts on Sea Turtles," held in Jacksonville, Florida. This workshop brought together representatives of the COE, NMFS, the U.S. Navy, the dredging industry and the environmental community to discuss the dredging/sea turtle conflict. In a July 8, 1988, letter from the Assistant Administrator for Fisheries to the Acting Commander of the COE, NMFS applauded the COE efforts in sponsoring the workshop and advised the COE of agency plans to assess the cumulative impacts to sea turtles of dredging in channels other than Canaveral. Formal consultation was requested for all areas in which hopper dredging was proposed, and observers were required on 25-100 percent of all hopper dredging activities in Brunswick, Savannah, and Wilmington Harbor dredging projects.

Consultation was reinitiated in 1991 in response to the high levels of turtle takes observed, as well as nearby strandings of crushed turtles, during hopper dredging in Brunswick and Savannah channels. The biological opinion, issued November 25, 1991, found that continued unrestricted hopper dredging in channels along the southeast region's Atlantic coast could jeopardize the continued existence of listed sea turtles. A reasonable and prudent alternative was given which included the prohibition of hopper dredging in the Canaveral channel, seasonal restrictions which allowed hopper dredging from December through March in channels from North Carolina through Canaveral, or use of alternative dredges in all southeastern U.S. channels.

The reasonable and prudent alternative issued in the 1991 biological opinion has proven very effective in reducing sea turtle captures. Since the implementation of the measures of the 1991 biological opinion, only 14 takes of sea turtles, includfng three live turtles, have been documented on board hopper dredges in channels along the southeastern U.S. Atlantic coast.

The COE has recently concluded extensive research in six southeast channels: Morehead City Harbor entrance channel, Charleston Harbor entrance channel, Savannah Harbor entrance channel, Brunswick Harbor entrance channel, Fernandina Harbor St. Marys River entrance channel, and the Canaveral Harbor entrance channel. Seasonal restrictions were supported by the research; however, refinements in the restrictions due to new, more precise information were requested in the COE request for a new consultation, dated November 8, 1994. Additionally, a draghead deflector has been developed that has shown promising results in preliminary tests.

PROPOSED ACTIVITY

This consultation addresses COE channel dredging activities along the southeastern Atlantic seaboard from North Carolina through Key West, Florida (see Figure 1 from COE's Biological Assessment submitted November 8, 1994). This includes maintenance dredging, new construction dredging, and beach nourishment activities. A summary of major channel dredging projects in which hopper dredges are normally used include: Oregon Inlet, Morehead City, and Wilmington Harbor in North Carolina; Charleston and Port

Royal in South Carolina; Savannah, Brunswick, and Fernandina-St. Marys in Georgia (King's Bay); Jacksonville, St. Augustine, Ponce Inlet, Canaveral, West Palm Beach, and Miami in Florida.

Information on the timing and amount of materials removed during past hopper dredging projects in these channels was provided in the Biological Assessment (COE, November 8, 1994). Generally, the COE has asked that channel hopper dredging windows specified in the 1991 biological opinion be modified from no hopper dredging in Canaveral and dredging in other regional channels from December through March to:

HOPPER DREDGING IN SOUTH ATLANTIC DIVISION

LOCATION	HOPPER DREDGING WINDOW[1]	INCIDENTAL TAKE MONITORING[2]
North Carolina to Pawlee Island, S.C.	Year Round	1 May - 1 Nov
Pawlee Island, S.C. to Tybee Island, Ga.	1 Nov - 31 May	1 Nov - 1 Jan 1 Apr - 31 May
Tybee Island, Ga. to Titusville, Fla.	15 Dec - 1 May	15 Dec - 1 Jan 15 Mar - 1 May
Titusville, Fla. to Key West, Fla.	Year Round[3]	Year Round

1 Applies to all hopper dredging along South Atlantic Coast. Use of sea turtle deflecting draghead is required unless waiver is granted by CESAD.

2 For navigation projects this requires inflow screens and NMFS approved observers. For beach nourishment projects this can be accomplished by either monitoring the beach or use of observers and screens on the hopper dredge.

3 Use of hopper dredging at Canaveral Navigation Channel will be restricted to those times when there is an urgent need for this type of equipment.

During a meeting between the COE and NMFS in February 1995, it was determined that the impacts of beach nourishment activities along the southeastern U.S. Atlantic coast should also be considered in this biological opinion. Therefore, projects being considered in this consultation include those listed in the Biological Assessment submitted on November 8, 1994, as well as channels south of Canaveral, and beach nourishment activities along the southeastern U.S. Atlantic coast in which hopper dredges may be used. Specific projects which have been considered in ongoing consultations include: Palm Beach Harbor maintenance dredging; the Fort Pierce Harbor entrance channel and turning basin; and the Dade County Beach Erosion Control Project at the northern end of Sunny Isles.

LISTED SPECIES AND CRITICAL HABITAT

Listed species under the jurisdiction of the NMFS that may occur in channels along the southeastern United States and which may be affected by dredging include:

THREATENED:
(1) the threatened loggerhead turtle - Caretta caretta

ENDANGERED:
(1) the endangered right whale - Eubalaena glacialis
(2) the humpback whale - Megaptera novaeangliae
(3) the endangered/threatened green turtle - Chelonia mydas
(4) the endangered Kemp's ridley turtle - Lepidochelys kempii
(5) the endangered hawksbill turtle - Eretmochelys imbricata
(6) the endangered shortnose sturgeon - Acipenserbrevirostrum

Green turtles in U.S. waters are listed as threatened, except for the Florida breeding population which is listed as endangered.

Information on the biology and distribution of these species was given in the 1991 biological opinion, and is incorporated by reference. Channel-specific information has been collected by COE for channels at Morehead City, Charleston, Savannah, Brunswick, Fernandina and Canaveral, and is presented in detail in the COE summary report entitled "Assessment of Sea Turtle

Abundance in Six South Atlantic US Channels" (Dickerson et al., 1994) and in the COE Biological Assessment. New information is included below.

Additional endangered species which are known to occur along the Atlantic coast include the finback (Balaenoptera physalus), the sei (Balaenoptera borealis), and sperm (Physeter macrocephalus) whales and the leatherback sea turtle (Dermochelys coriacea). NMFS has determined that these species are unlikely to be adversely affected by hopper dredging activities.

PROPOSED, THREATENED:
(1) Johnson's seagrass - Halophila johnsonii

According to federal regulations (50 CFR Section 402.10), a conference is required if a planned federal action is likely to jeopardize the continued existence of a proposed species. At this time, NMFS is unable to make a determination on the collective effects of hopper dredging in and adjacent to channels in which Johnson's seagrass occurs. The COE should develop estimates of annual take of seagrass anticipated by projects within Florida's intracoastal waterways within Johnson's seagrass habitat. Consideration of impacts to H. johnsonii should continue on a project-by-project basis until collective impacts have been estimated and/or listing has been finalized.

ASSESSMENT OF IMPACTS

Sturgeon

Table 1, taken from the February 6, 1995 draft Shortnose Sturgeon Recovery Plan (NMFS, 1995), gives the current, best available information on the distribution and abundance of shortnose sturgeon. South of the Chesapeake Bay, there is inadequate information to estimate the shortnose sturgeon population size in most rivers. Low abundance estimates have been made for the Ogeechee and Altamaha rivers.

Generally in southern rivers, adult sturgeon remain in estuaries and at the interface of salt and freshwater until late winter, when they move upriver to spawn. Embryos produced tend to remain in areas of irregular bottom, where they appear to seek cover. Juveniles, like adults, occur primarily at the interface between salt and freshwater. Recent observations suggest that salinity levels greater then seven ppt are harmful (Smith *et al.*, 1992). In the Savannah River, shortnose sturgeon are found over sand/mud substrate in 10-14 m. depths (Hall *et al.*, 1991). Spawning occurs in upstream channels of the Savannah, where the substrate consists of gravel, sand and logs (Hall *et al.*, 1991). Shortnose sturgeon feed on crustaceans, insect larvae, and mollusce (NMFS, 1995).

Impacts of hopper dredging on sturgeon

NMFS believes that shortnose sturgeon may be adversely affected by hopper dredging within some channels and seasons. While endangered species observers on hopper dredges have documented the take of Atlantic sturgeon, no take of a shortnose sturgeon has been observed. Sturgeon may be encountered in channels north of Pawles Island, South Carolina, where dredging may be conducted year-round. Winter windows south of Pawles, however, will reduce the period in which shortnose sturgeon may be impinged. Adult sturgeon may occur in estuarine and tidal waters until February, when they migrate upstream to spawn. Salinity ranges favorable to adults and juveniles can exist in inner harbors during fall months. Use of the rigid draghead deflector developed to reduce the likelihood of incidental take of sea turtles by hopper dredges may also reduce the take of shortnose sturgeon. The impacts on small juveniles, larvae, and eggs, by other suction dredge types used upriver, will be considered on a case-by-case basis.

In addition to the possibility of a direct take of sturgeon, maintenance dredging by all dredge types has likely reduced foraging areas within dredged channels, since inter-dredging periods may be too brief to allow forage species to re-establish. Current primary foraging habitat is thought to occur outside of dredged channels.

Shortnose sturgeon are not likely to be affected by beach nourishment activities.

Sea Turtles

Precise data regarding the total number of sea turtles in waters of the southeastern U.S. Atlantic are not available. Trends in turtle populations are identified through monitoring of their most accessible life stages on the nesting beaches, where hatchling production and the number of nesting females can be directly measured. Figures 2 through 4 illustrate loggerhead, green and Kemp's ridley nesting trends at regularly monitored nesting beaches.

Index nesting beaches on which data collection methods and effort were standardized were established in Florida in 1989. Over 90 percent of all U.S. loggerhead nests occur in Florida, and over 80 percent of these are within indexed beaches (B. Schroeder, pers comm). During the six years monitored in this standardized manner, illustrated in Figure 2, loggerhead nesting appears to be stable. All green turtle nests in the United States occur in Florida, and most occur on index beaches. The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the six years of regular monitoring (Figure 3).

The abundance of ridleys nests in Rancho Nuevo, Mexico, have been increasing since 1987 (Figure 4). Over 1500 nests were observed during the 1994 nesting season, representing the highest nesting year since monitoring was initiated in 1978. While these data need to be interpreted cautiously due to expanded monitoring efforts since 1990, up to 110,000 hatchlings were released from Rancho Nuevo during 1994, compared to 50,000 to 80,000 over the previous five to six years (Byles, pers comm).

Stranding data are generally believed to reflect the nearshore distribution of sea turtles (Figure 5). The use of turtle excluder devices (TEDs) in shrimp trawls is likely responsible for the sharp decrease in strandings after 1990 through a reduction in mortality resulting from incidental capture in shrimp trawls. While TEDs were required seasonally in most areas during much of 1990, compliance was poor until 1991. Since 1991, documented strandings of loggerheads were steady, while green turtle strandings increased in 1994 and ridleys in 1993 and 1994. Factors that may be affecting the distribution and abundance of sea turtles and turtle mortalities (ie. the distribution of strandings) include: vessel activity, fishery operations, and environmental factors such as storms, temperature changes, and eutrophication events.

The data suggest that green and Kemp's ridley turtle populations may be rising. While this supports cautious optimism, the numbers are well below recovery criteria established in the recovery plans.

Impacts of hopper dredging on sea turtles

Channels

NMFS believes that hopper dredging activities in the southeastern United States may adversely affect the endangered Kemp's ridley and Florida green turtles and the threatened loggerhead turtle. While hawksbill turtles likely occur infrequently in ship channels, they may be present during beach nourishment activities in areas near or between hard-bottom reefs.

Past maintenance dredging in the southeastern United States has been demonstrated to adversely affect sea turtles. The biological opinion issued in 1991 in response to the high levels of turtle takes observed, as well as nearby strandings of crushed turtles during hopper dredging in Brunswick and Savannah channels, concluded that continued unrestricted hopper dredging in channels along the southeast region's Atlantic coast could jeopardize the continued existence of listed sea turtles. Takes of 225 sea turtles had been documented since 1980 in southeast channels, including 22 turtles that were alive when found. The COE's strict adherence to the measures included in the 1991 biological opinion, including a prohibition of hopper dredging in Canaveral and seasonal restrictions on hopper dredging from North Carolina through the Canaveral ship channel, has greatly reduced the rate of sea turtle takes by hopper dredges. Only 14 sea turtle takes have been documented in hopper dredges since 1991, including three turtles that were alive when collected.

The COE conducted a comprehensive research program, beginning in 1991, to investigate the occurrence of sea turtles in six southeast channels to determine seasonal abundance, as well as spatial distribution within the channel and within the water column. Monthly surveys were conducted in Canaveral, Kings Bay, Brunswick, Savannah, Charleston, and Morehead City channels. The

Canaveral surveys supplement surveys conducted by NMFS and the CCE since 1978.

Briefly, the surveys found the following: In areas where sea turtles occur, moderate to high abundance can be expected when water temperature is greater than or equal to 21 degrees C. Lower abundances were observed when temperatures were less than 16 degrees C. Other workers have observed sea turtles in waters as low as 8 degrees C, sometimes for extended periods (Morreale, pers comm 1993). Loggerheads, primarily adults, were the most abundant turtle captured (n = 645), although some Kemp's ridleys (n = 20) and green turtles (n = 5) were also taken. Juveniles of all species were observed, although only a few juvenile loggerheads were encountered in Canaveral. As documented in previous surveys, the Canaveral ship channel supports aggregations of sea turtles during all months of the year and, particularly during cooler winter months (Henwood, 1987; Butler et al., 1987; Henwood and Ogren, 1987). North of Canaveral, turtles were seasonally abundant, with lower numbers from December through February. Recaptures of relocated sea turtles suggest some site fidelity, and the effectiveness of relocation efforts appeared to be related to the distance of relocation. Catch per unit effort (CPUE) in the surveyed channels, for all seasons cumulatively, was: Canaveral, 1.43 turtles per hour; Kings Bay, 0.571 turtles per hour; Brunswick Harbor, 0.489 turtles per hour; Charleston Harbor, 0.206 turtles per hour; and Morehead City Harbor, 0.025 turtles per hour.

As a result of observed CPUE, which were generally lower during cool water periods in the northern channels, the COE has asked NMFS to relax dredging windows to allow year-round dredging north of Pawles Island, South Carolina (which includes the ship channels at Oregon Inlet, Morehead City and Wilmington), and between November and May 31 from Tybee Island, Georgia through Pawles Island (including Charleston, Port Royal and Savannah channels). In recent years, the COE SAD has shown a willingness to cease dredging in channels in which take rates exceed those anticipated, despite the fact that the incidental take level was not approached. Given the COE's conservative record in these channels, and the great reduction in takes observed under current dredging windows, NMFS concurs that some expansion of hopper dredging windows, with requirements for observers and use of the rigid draghead deflector, may result in sea turtle takes, but is not likely to jeopardize the continued existence of any sea turtle species.

Beach Nourishment Activities

There has been increasing concern regarding the effects of hopper dredging during beach nourishment activities along the southeastern U.S. coast. Anecdotal accounts from divers and biologists suggest that sea turtles may use offshore fine sediment bottoms, as well as areas adjacent to hard bottom reefs, as internesting habitat. Limited observations have noted that at times of extreme drops in temperature, turtles have been observed buried in fine silt covering area reefs, either after beach nourishment or extreme freshwater runoff. Over 174 sea turtles have been observed on the sea surface during 16 right whale aerial surveys conducted between February 27 and March 19, 1995 along line transects within approximately 10 nm of the borrow area off of Jacksonville, Florida, suggesting an abundance of sea turtles in the vicinity of the borrow area. These turtles may be taken by hopper dredges. There has been no documented take of sea turtles during past beach nourishment activities at the borrow areas. However, due to potential impact, one hundred percent observer coverage is necessary for beach nourishment activities during the periods identified on the table. This observer coverage may be subsequently altered upon authorization from NMFS.

NMFS remains concerned that nearshore reefs, which provide foraging habitat and shelter for sea turtles, can be impacted by turbidity caused by dredging. While hopper dredges produce less turbidity than other dredge types, water quality impacts are still likely. State monitoring requirements do not relate directly to light restrictions caused by dredging, which has been shown to impact these ecosystems. Direct mechanical damage to hard bottom reefs, which may also be important turtle habitats, has also been documented (Draft Environmental Assessment prepared for the Second Periodic Nourishment of the Sunny Islands and Miami Beach Segments, Beach Erosion Control and Hurricane Protection Project, Dade County, Florida, January, 1995). The COE has proposed 1:1 mitigation of hard bottom habitat; however, replacement of biological material lost cannot be mitigated. Preventative steps should be identified within dredging contracts for borrow areas near hard-bottom reefs.

Rigid Draghead Deflector
Included within the COE's comprehensive research program, initiated in 1991, was a program to develop a mechanical solution to reduce the take of sea turtles at the dredge draghead. The COE SAD and the Waterways Experiment Station (WES) developed a rigid deflector for attachment to the draghead. This rigid draghead deflector has shown promising results during preliminary tests. The rigid device, similar in principal to the cow catchers developed for trains, is designed to deflect sea turtles encountered during hopper dredging activities. When deployed with mock turtles, the deflector draghead effectively avoided taking 95 percent of the models. According to the terms and conditions of the Incidental Take Statement issued for the 1991 biological opinion, testing of the effectiveness of the rigid deflector draghead in a channel where sea turtles occur present was necessary. NMFS recommended that the COE evaluate the new draghead in September in the Canaveral shipping channel, when juvenile turtles are present, but adults and gravid females are scarce. A supplementary biological opinion regarding the impacts of dredging using the deflector draghead in the Cape Canaveral channel for up to 15 days between September 14 and October 14, 1994 was issued in September 1994.

Although trawl sampling indicates that sea turtles were present in Canaveral at levels observed in previous years, only one sea turtle, a live green turtle, was observed entrained by the dredge. Twenty-one surface sightings of sea turtles were made in the channel, transit area, and at the disposal site. These results supported the mock turtle trials. However, despite the use of the rigid draghead deflector, two green turtle entrainments were documented in the Palm Beach Harbor entrance channel. Takes by a hopper dredge equipped with the deflector were also documented in Brazos Pass, in the Gulf of Mexico. NMFS believes that instruction of private dredge contractors is necessary to improve the performance of the rigid deflector draghead. Additionally, the effectiveness of the draghead may be dependent on the ability of the dredge operator to keep the dredging pumps disengaged when the dragheads are not firmly on the bottom to prevent impingement of sea turtles within the water column. Lastly, flexibility at the draghead is reportedly needed to improve the performance and ease of operation of this mechanical device. Additional assessment and development appears to be needed before the rigid draghead deflector can replace seasonal restrictions as a method of reducing sea turtle captures during hopper dredging activities.

Whales

Right whale
The nearshore waters of northeast Florida and southern Georgia were formally designated as critical habitat for right whales on June 3, 1994 (28793). These waters were first identified as a likely calving and nursery area for right whales in 1984. Since that time, Kraus et al. (1993) have documented the occurrence of 74 percent of all the known mature females from the North Atlantic population in this area. While sightings off Georgia and Florida include primarily adult females and calves, juveniles have also been observed.

Twenty percent of all right whale mortalities observed between 1970 and 1989 were caused by vessel collisions/interactions with right whales. Seven percent of the population exhibit scars indicative of additional, non-lethal vessel interactions (Kraus, 1990). As a result of the potential for interactions between hopper dredges and right whales, the 1991 biological opinion required observers on board dredges operating from December through March in Georgia and northern Florida to maintain surveys for the occurrence of right whales during transit between channels and disposal areas. Continuation of aerial surveys, which had been instituted in Kings Bay, Georgia, was also required. Since January 1994, aerial surveys funded by the COE in association with dredge activities in the southeast have been amplified through the implementation of the right whale early warning surveys. These surveys, funded by COE, as well as the Navy and Coast Guard, are conducted to identify the occurrence and distribution of right whales in the vicinity of ship channels in the winter breeding area, and to notify nearby vessel operators of whales in their path. The COE has been instrumental in NMFS' communications with other federal action agencies regarding the importance of pro-active protection of right whales through a cooperative recovery plan implementation team.

Whales observed on aerial and shipboard surveys are individually identified and counted, cow/calf pairs are recorded, and the movements and distribution of the whales are noted. Dredge speeds are reduced to five knots or less during evening hours or periods of low visibility for 24 hours after sightings of right whales within 10 nm of the channel or disposal areas.

Data collected during these surveys suggest that right whales are observed off Savannah, Georgia, in December and March, and are relatively abundant between Brunswick, Georgia, south to Cape Canaveral from December through March. During early 1995, a right whale was also observed by shipboard observers off Morehead City, North Carolina (1/10/95, probable right whale).

Humpback whale

Humpback whales occur in waters under U.S. jurisdiction throughout the year. Migrations occur annually between their summer and winter ranges. The summer range for the Western North Atlantic stock includes the Gulf of Maine, Canadian Maritimes, western Greenland, and the Denmark Strait. All humpback whales feed while on the summer range.

The primary winter range includes the Lesser Antilles, the Virgin Islands, Puerto Rico, and the Dominican Republic (NMFS, 1991). In general, it is believed that calving and copulation take place on the winter range. Calves are born from December through March and are about 4 meters at birth. Sexually mature females give birth approximately every two to three years. Sexual maturity is reached between 4 and 6 years of age for females and between 7 and 15 years of age for males. Size at maturity is about 12 meters.

Until recently, humpback whales in the mid- and south Atlantic were considered transients. Few were seen during aerial surveys conducted over a decade ago (Shoop et al., 1982). However, since 1989, sightings of feeding juvenile humpbacks have increased along the coast of Virginia and North Carolina, peaking during the months of January through March in 1991 and 1992 (Swingle et al., 1993). Studies conducted by the Virginia Marine Science Museum (VMSM) indicate that these whales are feeding on, among other things, bay anchovies and menhaden. Researchers theorize that juvenile humpback whales, which are unconstrained by breeding requirements that result in the migration of adults to relatively barren Caribbean waters, may be establishing a winter foraging area in the mid-Atlantic (Mayo, pers comm, 1993). The lack of sightings south of the VMSM study area is a function of shipboard sighting effort, which was restricted to waters surrounding Virginia Beach, Virginia.

In concert with the increase in whale sightings, strandings of humpback whales have increased between New Jersey and Florida since 1985. Strandings were most frequent during the months of September through April in North Carolina and Virginia waters, and were composed primarily of juvenile humpback whales of no more then 11 meters in length (Wiley et al., 1995). Of the 18 humpbacks for which the cause of mortality was determined, 6 (33 percent) were killed by vessel strikes. An additional humpback had scars and bone fractures indicative of a previous vessel strike that may have contributed to its mortality.

Shipboard observations conducted during daylight hours during dredging activities in the Morehead City Harbor entrance channel during January and February 1995 documented sightings of young humpback whales on at least six days near the channel and disposal area, until the last sighting on January 22, 1995. Three humpback strandings were documented in North Carolina, one each in February, March, and April, suggesting that humpback whales remained within waters of the South Atlantic Division through April.

Impacts of hopper dredging on whales

Hopper dredging may adversely affect right and humpback whales, which occur during winter months in the vicinity of dredging projects within the SAD. While dredging itself is not likely to be a problem, the transit of hopper dredges between borrow, channel, and disposal areas is likely to result in increased vessel traffic in the vicinity of humpback and right whales, especially within right whale critical habitat. As discussed above, ship strikes are one of the primary human-caused sources of mortality for both humpback and right whales, and increased vessel traffic may increase the likelihood of whale/vessel interactions. Although whales have been observed in areas of dredge operations, as discussed below, there have been no documented collisions between dredges and whales.

Observers on dredges have documented close approaches between whales and dredges. On February 6, 1988, a right whale reacted to the approach of a hopper dredge within 100 yards by orienting itself toward the vessel in a defensive profile. On February 28, 1988, during clamshell dredging of Canaveral channel, a right whale remained in the Canaveral channel for a period of about 10 minutes. Fortunately, this took place during daylight hours and when no vessels were transiting the channel. On January 12, 1995, a humpback whale was observed within a quarter of a mile of the dredge at Wilmington channel and resurfaced near the dredge. An approaching humpback on January 13, 1995 was observed ahead of the dredge initially, but resurfaced near the stern after the vessel slowed. Dredging was stopped while the whale, and two other humpbacks nearby, approached within 100 yards, including one passage under the bow. On January 18, still within the Wilmington Harbor channel dredging area, one of a few humpbacks observed feeding surfaced and quickly dove again within 10 meters of the dredge.

NMFS believes that the cooperation of the dredge operators with endangered species observers greatly reduces the chance of whale/dredge interactions. Additional precautions that reduce the likelihood of dredge collisions with endangered whales include: aerial surveys conducted in right whale critical habitat during the breeding season, the adoption by dredge operators of necessary precautions when whales are sighted, and reduction in dredge speed during evening hours or days of limited visibility when whales have been spotted within the previous 24 hours.

CONCLUSIONS

NMFS concludes that endangered and threatened sea turtles, including the threatened loggerhead (Caretta caretta), and endangered Kemp's ridley (Lepidochelys kempii), green (Chelonia mydas) and hawksbill (Eretmochelys imbricata) sea turtles, may be adversely affected by hopper dredging of channels and during beach nourishment activities along the U.S. southeast Atlantic coast, but are not likely to be jeopardized under the terms and conditions of the attached Incidental Take Statement. Shortnose sturgeon (Acipenser brevirostrum) may be adversely affected by hopper dredging of channels, but are not likely to be jeopardized in rivers of the Southeast Region. Right whales (Eubalaena glacialis) and humpbacks (Megaptera novaengliae) also may be adversely affected due to increased vessel traffic, but severe impacts can be avoided through continued cooperation between dredge operators and endangered species observers during the seasons whales may occur in the project area.

CONSERVATION RECOMMENDATIONS

Pursuant to section 7(a)(1) of the ESA, the following conservation recommendations are made to assist the COE in reducing/eliminating adverse impacts to loggerhead, green, and Kemp's ridley turtles that result from hopper dredging in the southeastern United States. Many of these recommendations have been discussed and agreed upon at the recent COE/NMFS meeting in St. Petersburg, Florida.

1. The COE should continue to investigate possible modifications to existing dredges which might reduce or eliminate the take of sea turtles. The effectiveness of the rigid draghead deflectors should continue to be evaluated.

2. Spring and fall surveys are necessary in the Canaveral shipping channel to identify sea turtle temporal and spatial movement patterns if hopper dredging will be needed regularly for the Canaveral channel in the future. Telemetry using depth recorders may be needed to obtain information on water column use.

3. Spatial distribution of sea turtles taken in COE trawl surveys of southeast ship channels appeared to be non-random. Additional investigation into the characteristics of "preferred" sites may provide information to expand dredging windows in channel areas adjacent to these areas of greater abundance.

4. The COE should provide NMFS with a list of inshore and offshore borrow areas along the southeastern U.S. Atlantic in which hopper dredges are likely to be used. Frequency of anticipated beach nourishment activities should be identified as accurately as possible.

5. The COE should summarize information regarding borrow areas in which hopper dredges may be deployed. Information regarding the biological resources found at each borrow area should be listed to identify the possible suitability of the area for foraging sea turtles.

6. The COE should evaluate the collective impact of all dredging projects within the Florida intracoastal waterways on Johnson's seagrass. A summary of anticipated projects and estimates of annual seagrass take levels should be developed to allow NMFS to provide a comprehensive conference or consultation.

7. NMFS, based on the recommendations of Griffen (1974), has recommended water column sediment load deposition rates of no more then 200 mg/cm^2/day, averaged over a seven day period to protect coral reefs and hard bottom communities, rather than use of only state standards.

INCIDENTAL TAKE STATEMENT

Section 7(b)(4) of the Endangered Species Act (ESA) requires that when a proposed agency action is found to be consistent with section 7(a)(2) of the ESA, and the proposed action may incidentally take individuals of listed species, NMFS will issue a statement that specifies the impact of any incidental taking of endangered or threatened species. It also states that reasonable and prudent measures, and terms and conditions to implement the measures, be provided that are necessary to minimize such impacts. Only incidental taking resulting from the agency action, including incidental takings caused by activities approved by the agency, that are identified in this statement and that comply with the specified reasonable and prudent measures, and terms and conditions, are exempt from the takings prohibition of section 9(a), pursuant to section 7 of the ESA.

Based on results of previous hopper dredging activities in southeastern U.S. channels, new information regarding Kemp's ridley and green sea turtle abundance, and expanded dredging windows and appended monitoring of beach nourishment activities in the South Atlantic Division, NMFS anticipates that future hopper dredging activities may result in the injury or mortality of loggerhead, Kemp's ridley, green, and hawksbill turtles. Therefore, a low level of incidental take, and terms and conditions necessary to minimize and monitor takes, is established. The documented incidental take, by injury or mortality, of seven (7) Kemp's ridleys, seven (7) green turtles, two (2) hawksbills, twenty (20) loggerhead turtles, and five (5) shortnose sturgeon is set pursuant to section 7(b)(4) of the ESA. This take level represents the total authorized take per year for hopper dredging in the Atlantic projects of the South Atlantic Division (SAD).

To ensure that the specified levels of take are not exceeded early in any project, the COE should reinitiate consultation for any project in which more than one turtle is taken in any day, or once five or more turtles are taken. The Southeast Region, NMFS, will cooperate with the COE in the review of such incidents to determine the need for developing further mitigation measures or to terminate the remaining dredging activity. Formal consultation must be reinitiated when 75% of the authorized incidental take is reached. The authorization for these incidental takes expires on August 31, 2000.

Section 7(b)(4)(c) of the ESA specifies that in order to provide an incidental take statement for an endangered or threatened species of marine mammal, the taking must be authorized under section 101(a)(5) of the Marine Mammal Protection Act of 1972 (MMPA). Since no incidental take in the Atlantic Region has been authorized under section 101(a)(5) of the MMPA, no statement on incidental take of listed right whales is provided.

The reasonable and prudent measures that NMFS believes are necessary to minimize the impact of hopper dredging in the southeastern United States have been discussed with the COE. The following terms and conditions are established to implement these measures and to document the incidental take should such take occur. It is anticipated that beach nourishment will not occur year-round, due to environmental protections instituted by other agencies.

1. Regular maintenance activity in Canaveral Harbor shall not be conducted with a hopper dredge. A hopper dredge should be considered only under emergency conditions when no other type of dredge can be used to remove hazardous shoaling in an expedited timeframe. Separate, specific Section 7 consultations must be conducted for all dredging activities in the Canaveral ship channel that may require the use of a hopper dredge. These consultations will be accelerated if warranted by emergency conditions.

2. One hundred percent inflow screening is required, and 100 percent overflow screening is recommended when sea turtle observers are required on hopper dredges in areas and seasons in which sea turtles may be present (see table below). If conditions disallow 100 percent inflow screening, inflow screening can be reduced but 100 percent overflow screening is required, and an explanation must be included in the preliminary dredging report (see 6, below).

3. The sea turtle deflecting draghead is required for all hopper dredging during the months that turtles may be present, unless a waiver is granted by the COE SAD in consultation with NMFS.

4. Beach observers cannot be used in place of shipboard observers for hopper dredging of borrow areas unless the COE

can demonstrate that the volume of sand deposited on beaches will not preclude observation and identification of turtles or turtle parts.

5. To prevent impingement of sea turtles within the water column, every effort should be made to keep the dredge pumps disengaged when the dragheads are not firmly on the bottom.

6. Reporting: A preliminary report summarizing the results of the dredging and the sea turtle take must be submitted to the COE and NMFS within 30 working days of completion of any given dredging project. An annual report (based on either calendar or fiscal year) must be submitted to NMFS summarizing hopper dredging projects, documented sea turtle and sturgeon incidental takes, and whale sightings.

7. The COE's continued participation in the Right Whale Early Warning System is necessary. Dredging within right whale critical habitat from December through March must follow the protocol established within the Early Warning System.

8. NMFS requires monitoring by endangered species observers with at-sea large whale identification experience to conduct daytime observations for whales between December 1 and March 31, when humpback and right whales occur in the vicinity of channels and borrow areas, north of Cape Canaveral. Monitoring will be 100% for the first year of the biological opinion, unless subsequently altered upon authorization from NMFS. During daylight hours, the dredge operator must take necessary precautions to avoid whales. During evening hours or when there is limited visibility due to fog or sea states of greater than Beaufort 3, the dredge must slow down to 5 knots or less when transitting between areas if whales have been spotted within 15 nm of the vessel's path within the previous 24 hours. South of Cape Canaveral, surveys for whales should be conducted by endangered species observers during the intervals between dredge spoil monitoring.

9. The seasonal observer requirements under these terms and conditions are listed on the following table. North of the St. Johns River, in Florida, endangered species observers on hopper dredges within nearshore and riverine areas must also monitor for shortnose sturgeon impingements.

RESTRICTIONS AND MONITORING REQUIREMENTS FOR HOPPER DREDGING ACTIVITIES IN THE ATLANTIC WATERS OF THE COE SOUTH ATLANTIC DIVISION

AREA	WHALE MONITORING for beach nourishment, navigation channels, and transit	SEA TURTLE MONITORING: NAVIGATION CHANNELS		SEA TURTLE MONITORING: BEACH NOURISHMENT ACTIVITIES	
		WINDOWS	MONITORING	WINDOWS	MONITORING[1]
North Carolina to Pawles Island, SC (includes channels at Oregon Inlet, Morehead City and Wilmington)	100% dedicated daytime whale observer coverage between 1 Dec and 31 Mar. Monitoring by sea turtle observer between 1 Apr and 30 Nov.	Year Round	100% observer monitoring from 1 Apr - 30 Nov	Year Round	100% observer monitoring from 1 Apr - 30 Nov
Pawles Island, SC to Tybee Island, GA (includes channels at Charleston, Port Royal and Savannah)	100% dedicated daytime whale observer coverage between 1 Dec and 31 Mar. Monitoring by sea turtle observer between 1 Apr - 30 Nov.	1 Nov - 31 May	100% observer monitoring from 1 Nov - 30 Nov and 1 Apr - 31 May	Year Round	100% observer monitoring from 1 Apr - 30 Nov
Tybee Island, GA to Titusville, FL (includes channels at Brunswick, Kings Bay, Jacksonville, St. Augustine, and Ponce de Leon Inlet)	Aerial surveys in right whale critical habitat, 1 Dec thru 31 Mar. 100% dedicated daytime whale observer coverage between 1 Dec and 31 Mar.	1 Dec - 15 Apr	100% observer monitoring from 1 Apr - 15 Apr	Year Round	100% observer monitoring from 1 Apr - 15 Dec
Titusville, FL to Key West, FL (includes channels at West Palm Beach, Miami and Key West)	Whale observations are not necessary beyond those conducted between monitoring of dredge spoil.	Year Round	100% observer monitoring year round	Year Round	100% observer monitoring year round

[1] 100% of the dredge material must be screened and 100% of the screened material must be observed.

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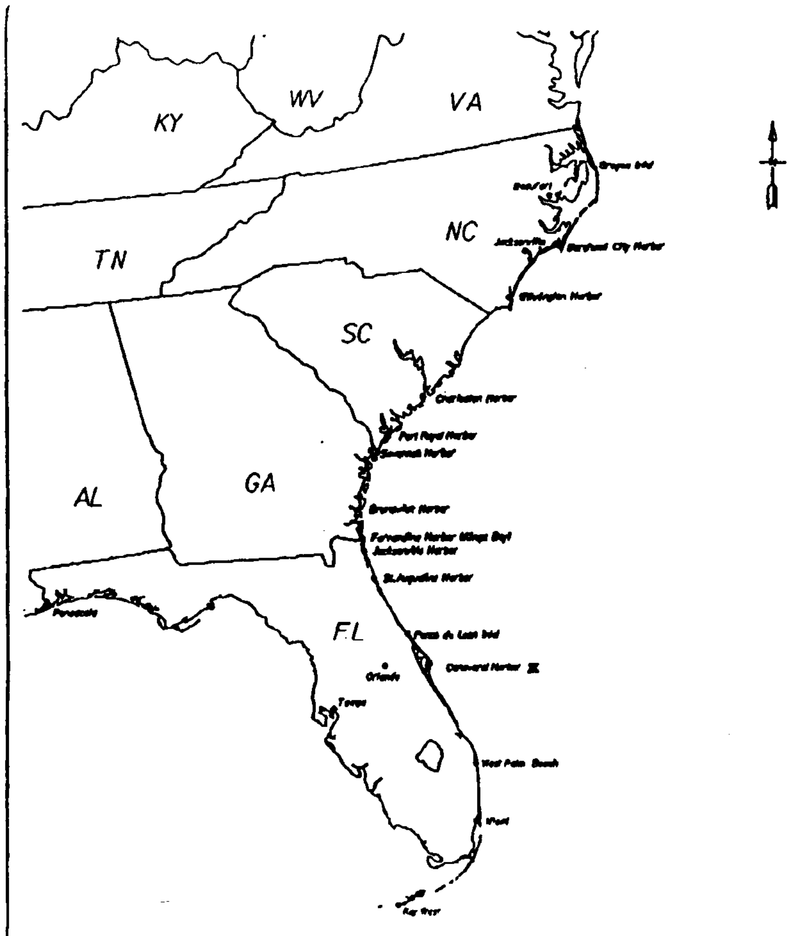
Table 1 Shortnose Sturgeon Population Estimates.

Locality	Time Segment	Population Segment	Marked m	Captured c	Recaptured r	Estimate Type	Population Estimate	Precision 95% CI		mc/4N	Source and Notes
St. John	1973-77	Adult	3,705	4,082	343	S-J	18,000	±30%		>1	Dadswell (1979)
Kennebec	1977-81	Adult	675	272	34	PET	6,273	3,632	6,914	8.7	Squiers et al. (1982)
	1977-81	Adult	703	272	58	SCH	7,222	5,046	10,765		Squiers et al (1982)
Merrimack	1989	Spawning, males				CAP	5	5	20		Kynard (unpublished data)
	1988-90	Spawning, males				CAP	12	10	28		Kynard (unpublished data)
	1989-90	Total				CAP	33	18	89		Kynard (unpublished data)
Connecticut											
Upper	1992	Spawning				CAP	47	33	80		Kynard (unpublished data)
	1993	Spawning				CAP	98	58	231		Kynard (unpublished data)
	1976-77	Total	81	162	16	PET	516	317	898	>1	Taubert (1980)
	1976-78	Total	51	56	4	PET	714	280	2,856	>1	Taubert (1980)
	1977-78	Total	119	56	18	PET	370	235	623	>1	Taubert (1980)
	1976-78	Total	170	56	24	PET	297	267	618	>1	Taubert (1980)
Lower		Total				SHU	895	799	1,018		Savoy and Shake (1993)
		Total				SCH	878				
		Total				CHA	868				
Hudson	1979	Spawning	546	899	38	PET	12,669			>1	Dovel (1981)
	1980	Spawning	611	898	40	PET	13,844			>1	Dovel (1981)
	1980	Total					30,311				Dovel (1981), extrapolation
Delaware	1981-84	Partial				PET	14,080	10,079	20,378		Hastings et al. (1987)
	1981-84	Partial				SCH	12,796	10,288	16,267		Hastings et al. (1987)
	1983	Partial				S-J	6,408				Hastings et al. (1987)
Ogeechee	1993	Total	31	36	5	PET	223				Rogers and Webber (1993)
Altamaha	1991	Total	551			SPET	3,250				Rogers (unpublished data)

Estimates Type:
S-J: Seber Jolly
PET: Modified Peterson
SCH: Modified Schnabel
CAP: CAPTURE Methodology
SHU: Schumacher
CHA: Chapman
SPET: Simple Peterson



LOCATION OF SOUTHEASTERN HARBOR PROJECTS IN WHICH HOPPER DREDGES ARE USED

※ NOTE: HOPPER DREDGING IN CANAVERAL HARBOR WAS SUSPENDED IN 1991.

FIGURE 1

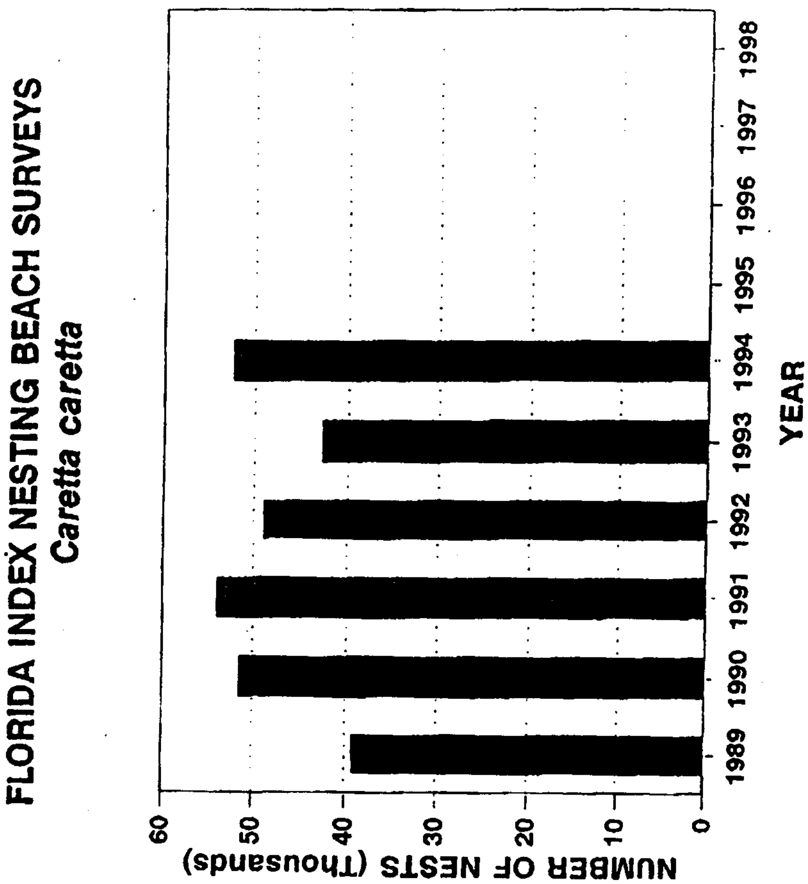

FLORIDA INDEX NESTING BEACH SURVEYS
Caretta caretta
NUMBER OF NESTS (Thousands)
0
10
20
30
40
50
60
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
YEAR

FIGURE 2

FIGURE 3

FLORIDA INDEX NESTING BEACH SURVEYS
Chelonia mydas

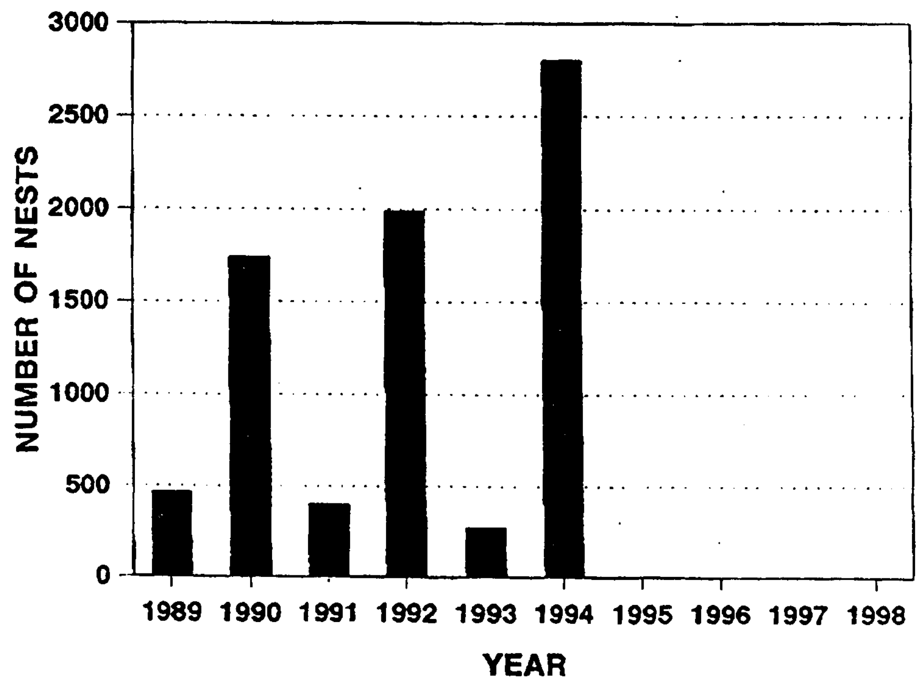


FIGURE 4

KEMP'S RIDLEY NESTS AT RANCHO NUEVO
FWS/INP DATA 1978-1994 (R BYLES 12/94)

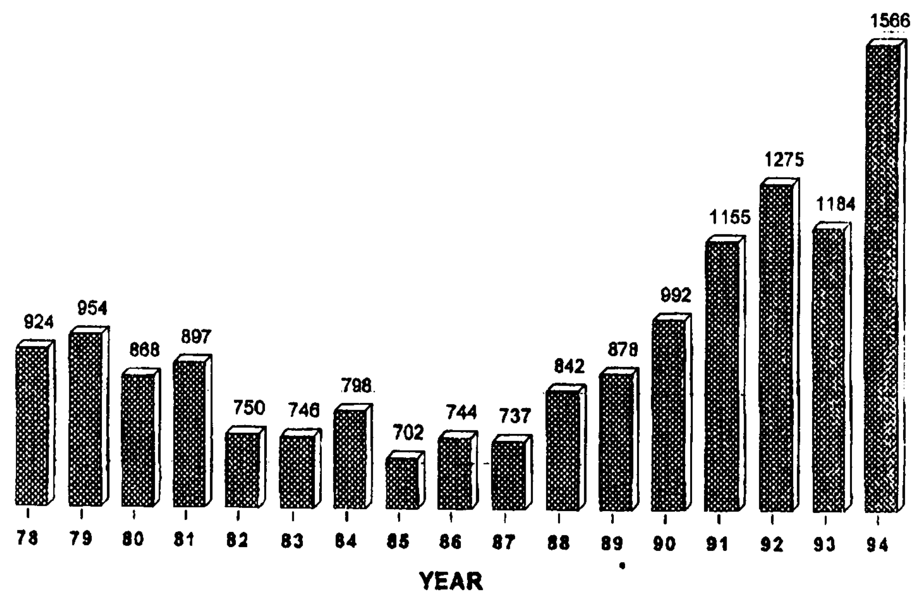
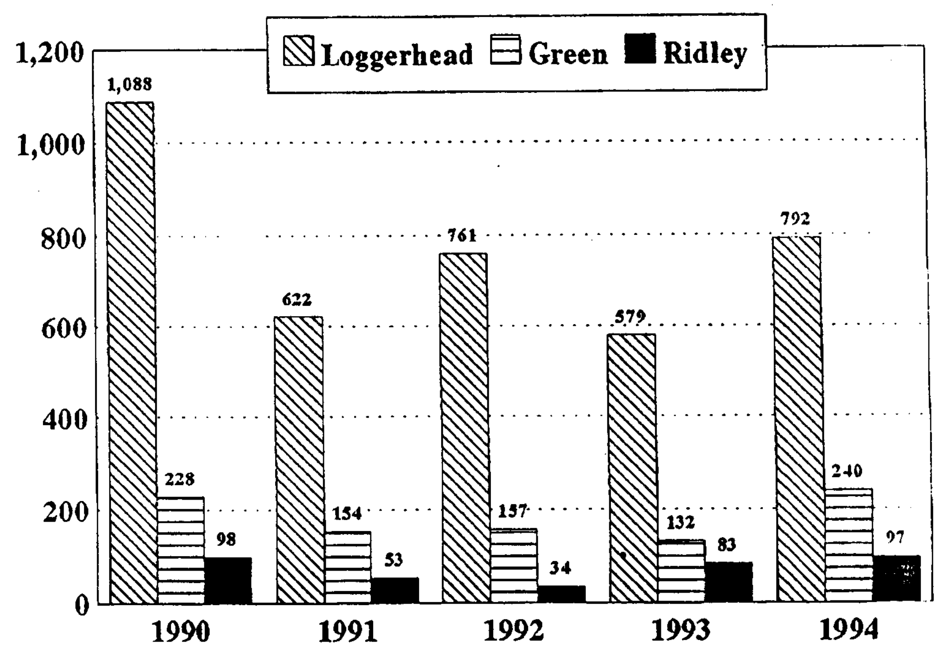


Figure 5

Southeast U.S. Atlantic Coast

Sea Turtle Strandings, 1990 - 1995



July 7, 1994

Planning Division
Environmental Branch

Mr. David Ferrell
Field Supervisor
U.S. Fish and Wildlife Service
P.O. Box 2676
Vero Beach, Florida 32961-2676

Dear Mr. Ferrell:

This is in reference to Region III of the Coast of Florida Erosion and Storm Effects Study.

Enclosed for your use are 13 computer disks containing the results of the side scan sonar survey. Data files included on these disks are: hardground boundaries, the shoreline boundary, bathymetric contours, and the boundary of the area surveyed. The disks are DOS formatted ready for PC ARC/INFO import.

Sincerely,

A. J. Salem
Chief, Planning Division

Enclosures

January 19, 1995

Planning Division
Environmental Branch

Mr. Jim Miller
Bureau of Archeological Research
Division of Historical Resources
R. A. Gray Building
500 South Bronough Street
Tallahassee, Florida 32399-0250

Dear Mr. Miller:

The Jacksonville District, U.S. Army Corps of Engineers, is gathering information to help define issues and concerns that will be addressed in the Coast of Florida Erosion and Storm Effects Study (COFS). The study is a cooperative effort between the District and the Florida Department of Environmental Protection to investigate coastal processes on a regional basis for the purpose of recommending modifications for existing shore protection and navigation projects.

Enclosed are three reports which together comprise the Geographic Information System (GIS) database design for the subject study. These reports are being provided to you in response to a January 18, 1995, telephone conversation with Ms. Janice Adams, Corps of Engineers. So that potential impacts to cultural resources will be addressed in the COFS, the Jacksonville District will include information on these resources in the developed database.

In compliance with the National Historic Preservation Act, written coordination with the Florida State Historic Preservation Officer (SHPO) has been initiated for the Draft Environmental Impact Statement that is currently being prepared for Region III of the Coast of Florida. Studies required for each region of the Coast of Florida study will be coordinated with the SHPO.

Sincerely,

A. J. Salem
Chief, Planning Division

Enclosures

FLORIDA DEPARTMENT OF STATE
Jim Smith
Secretary of State
DIVISION OF HISTORICAL RESOURCES
R.A. Gray Building
500 South Bronough
Tallahassee, Florida 32399-0250
Director's Office (904) 488-1480
Telecopier Number (FAX) (904) 488-3353

December 8, 1994

Mr. A. J. Salem
Planning Division
Environmental Branch
Department of the Army
Jacksonville District
Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019

In Reply Refer To:
Laura A. Kammerer
Historic Sites
Specialist
(904) 487-2333
Project File No. 944131

RE: Region III of the Coast of Florida Erosion and
Storm Effects Study
Draft Environmental Impact Statement Preparation
Broward, Dade and Palm Beach Counties, Florida

Dear Mr. Salem:

This study region contains hundreds of shipwrecks. They are most frequently located in 20 feet or less of water, or in association with the first and second reef lines along the southeastern coast of Florida. We suggest that your office contact the following agencies regarding local shipwreck information:

Steve Higgins
Broward County Biological Resources Division
305/519-1265

Richard Curry
Biscayne National Park
305/247-2044

There are also hundreds of prehistoric and historic archaeological sites in this coastal region. Enclosed is the most current Florida Master Site File printouts of properties in Broward, Dade and Palm Beach Counties listed, or eligible for listing in the *National Register of Historic Places*.

The following proposed modifications for existing shore protection and navigation projects are likely to affect historic shipwrecks: sand bypassing at inlets using conventional dredging, construction of groins and/or offshore breakwaters, construction of sand traps and offshore borrowing. The following activities are likely to affect upland prehistoric and historic properties: dune construction and upland sand borrow sources.

As you are aware, many of the proposed shore protection and navigation projects will have to be coordinated on a case-by-case basis with this office. We look forward to working with you and providing more specific concerns and information regarding important cultural resources as projects are developed and implemented.

If you have any questions concerning our comments, please do not hesitate to contact us. Your interest in protecting Florida's historic properties is appreciated.

Sincerely,

Laura A. Kammerer

for George W. Percy, Director
Division of Historical Resources
and
State Historic Preservation Officer

GWP/Klk
Enclosure

Department of Environmental Protection

Lawton Chiles
Governor

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Virginia B. Wetherell
Secretary

November 14, 1994

Mr. Scott Hoffeld
Gulf Engineers & Consultants
P.O. Box 84010
Baton Rouge, LA 70884-4010

RE: Coast of Florida Study Marine Turtle and Manatee Issues

Dear Mr. Hoffeld:

As we discussed on the phone, the federal projects in the area encompassed by the Coast of Florida do have a high probability of encountering manatees and marine turtles. In general, the projects you have listed are either on or near the beaches and inlets and do not include harbor projects. For this reason, our Office typically recommends standard manatee protection conditions be implemented during construction. These standard conditions are very familiar to the Corps and to construction contractors. In the areas you listed, manatees are occasionally sighted moving through inlets or more infrequently swimming in the open ocean within the limits of some of the project boundaries. No congregation areas of manatees have been reported in the nearshore ocean areas of Palm Beach, Broward and Dade counties. Manatees utilizing the inlets have been documented, however, no significant foraging habitat is reported within the limits of the inlet projects on your list. Manatees would be more likely encountered by support boats moving from marinas and dock areas through the channels and inlets towards dredge vessels. The standard manatee protection conditions I referenced earlier would require signs be posted on work boats informing crew of the possibility of manatees being sighted and notifying them of the appropriate responses should manatees be in the area.

Marine turtles are far more likely to be encountered during operation, maintenance, and new construction activities within the Coast of Florida Study area. Nests of the threatened loggerhead (Caretta caretta) turtle are the most common in all three counties. Nesting numbers of the endangered leatherback (Dermochelys coriacea) turtle are very significant in Palm Beach county and occasionally reported from Broward and Dade counties. The endangered green (Chelonia mydas) turtle is a frequent nester in the project areas listed for Palm Beach and Broward counties and an occasional nester in Dade County. The endangered Hawksbill (Eretmocheyles imbricata) turtle has been recorded nesting in all three counties on an infrequent basis. Although there are no routine surveys of the open ocean waters, marine turtles are present for much of the year in the region because of the water temperatures and nearshore rock habitat. It is likely that different special construction conditions would be needed to ensure protection of marine turtles for the various types of projects encompassed by the Coast of Florida Study. For example, beach restoration or renourishment projects should be planned to avoid the main portion of nesting season (March 1 to October 31 for Palm Beach and Broward, May 1 to October 31 for Dade). Each project might also have specific monitoring requirements to ensure that beach compaction and escarpments do not interfere with marine turtle nesting activity. Finally, open ocean borrow activities might disturb marine turtles and their habitat therefore special precautions might be needed for dredges operating around hardbottom habitat.

Within the time frame provided for these comments, we could not generate the actual historical nesting data for the areas identified. We are currently in press with a report covering the nesting data between 1979 and 1992. Unfortunately, the data is reported to us by survey areas which do not always correspond with federal project limits. For example, we have nesting data from 7 different segments of the Dade County shoreline. Our Golden Beach segment is 1.9 km long while the federal project length is 1.1 miles. The Sunny Isles, Bakers Haulover, Bal Harbour, Surfside and Miami Beach federal projects are all within our general segment of Miami Beaches. It is very similar for the other two counties. For this reason, we typically speak of nesting in terms of the average densities encountered in the County as well as more project specific densities if they are available. If in your continued work on this environmental review it is determined that nesting data for all three counties is desired, please let me know and we will try to generate that information for you.

I hope this general information is helpful. Should you have any other questions, please feel free to call me at (904)922-4330.

Sincerely,

David W. Arnold

David W. Arnold
Biological Administrator

DWA/da

November 9, 1994

Planning Division
Environmental Branch

Mr. George Percy
Division of Historical Resources
500 South Bronough
Tallahassee, Florida 32399

Dear Mr. Percy:

The Jacksonville District U.S. Army Corps of Engineers, is gathering information to help define issues and concerns that will be addressed in a Draft Environmental Impact Statement (DEIS) for Region III of the Coast of Florida Erosion and Storm Effects Study. The study is a cooperative effort between the Corps of Engineers and the Florida Department of Environmental Protection to investigate coastal processes on a regional basis for the purpose of recommending modifications for existing shore protection and navigation projects.

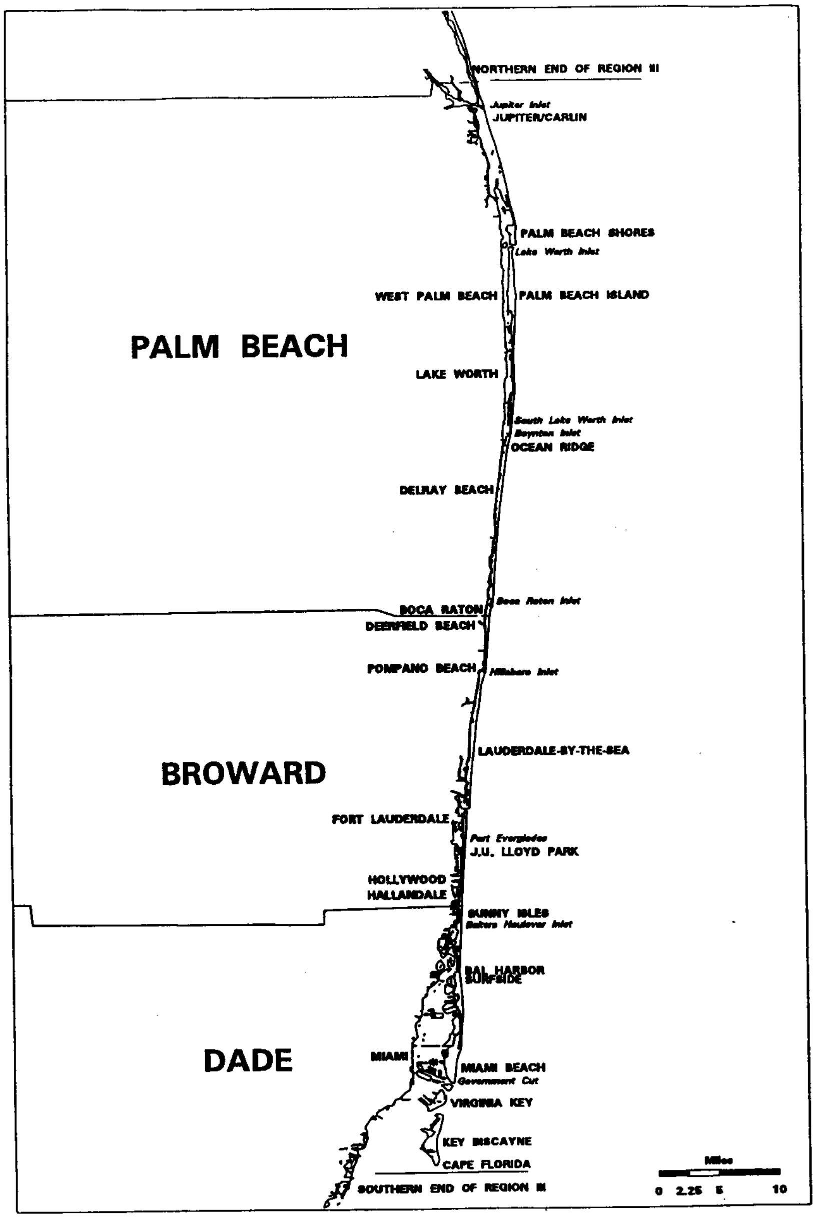
The study area includes most of the Atlantic and Gulf Coast of Florida and has been divided into five coastal regions. The focus of the DEIS is Region III which consists of 92 miles of Atlantic Ocean coastline within Palm Beach, Broward, and Dade counties. Refer to the enclosed location map. Several alternatives are being considered in the study and will be addressed in the DEIS. These include: 1) continued renourishment of existing projects, 2) design modifications to existing projects where needed, 3) sand bypassing at inlets using sand transfer plants and/or conventional dredging, 4) nearshore placement of suitable maintenance dredged material to feed adjacent beaches, 5) use of suitable maintenance dredged material as beach fill, 6) construction of groins and/or offshore breakwaters, 7) dune construction, 8) construction of sand traps at inlets to aid in sand bypassing, and 9) sand tightening existing jetties to where the need has been identified. Sources of sand that have been identified include offshore borrow areas, upland sand sources, suitable material from maintenance dredging, and the possible use of Bahamian aragonite. In addition to biological resources, it is anticipated that significant historic and archeological resources are located within the study area.

We request that your office provide comments and information about resources and important cultural features within the described area. In compliance with the National Historic Preservation Act, as amended, and 36 CFR Part 800, your comments are requested within 30 calendar days of the date of this letter.

Sincerely,

A. J. Salem
Chief, Planning Division

Enclosure


NORTHERN END OF REGION III
Jupiter Inlet
JUPITER/CARLIN
PALM BEACH SHORES
Lake Worth Inlet
WEST PALM BEACH
PALM BEACH ISLAND
PALM BEACH
LAKE WORTH
South Lake Worth Inlet
Boynton Inlet
OCEAN RIDGE
DELRAY BEACH
Boca Raton Inlet
BOCA RATON
DEERFIELD BEACH
POMPANO BEACH
Hillsboro Inlet
LAUDERDALE-BY-THE-SEA
BROWARD
FORT LAUDERDALE
Port Everglades
J.U. LLOYD PARK
HOLLYWOOD
HALLANDALE
SUNNY ISLES
Bakers Haulover Inlet
BAL HARBOR
SURFSIDE
DADE
MIAMI
MIAMI BEACH
Government Cut
VIRGINIA KEY
KEY BISCAYNE
CAPE FLORIDA
SOUTHERN END OF REGION III
Miles
0 2.25 5 10

United States Department of the Interior
FISH AND WILDLIFE SERVICE
P.O. BOX 2676
VERO BEACH, FLORIDA 32961-2676

September 30, 1994

Colonel Terry L. Rice
District Engineer
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019

RE: Coast of Florida
Environmental Study Plan

Dear Colonel Rice:

The U.S. Fish and Wildlife Service (Service) provides the following Interim Fish and Wildlife Coordination Report on the Coast of Florida Study. This report is submitted in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and Section 7(a)(2) of the Endangered Species Act, as amended (16 U.S.C. 1531 et seq.). This does not represent the Section 2(b) report of the Secretary of the Interior.

It is our understanding that the Coast of Florida Study may result in the authorization of as many as 13 new coastal construction projects. Little is currently known about the environmental consequences of these proposed actions. As agreed with your Planning Division staff, the Service will provide a separate Coordination Act report on each of the projects proposed as a result of the Coast of Florida Study. As the Coast of Florida Study continues, the Service will supplement this report regarding the environmental effects of proposed projects through further fish and wildlife investigations.

BACKGROUND

The Coast of Florida Study (Study) is a multi-year project to examine the entire developed east and west coast shorelines of Florida. The objective of the study is to develop a comprehensive database of relevant engineering, economic, and environmental parameters to aid in the development of shore protection projects while minimizing environmental impacts.

The Service has been involved in the Study since 1989. At that time, the Service recommended that subtidal habitats (reefs) within Region III of the Study (Dade, Broward and Palm Beach Counties) be mapped using side scan sonar. This mapping has recently been completed and the various reef areas found within the areas of influence of Coast of Florida Study Projects await assessment. Finding an efficient sampling method to survey the project area is necessary in order to thoroughly determine values of the extensive habitat potentially affected. Service biologists accompanied personnel from Seabyte, Inc. in August to observe the use of underwater video survey methods. The method provides an interface between the video and a Geographic Information System database which has been employed for the Study. Use of this methodology has been rejected by the Corps as being too costly. A new methodology has yet to be proposed.

STATUS OF CURRENT PLANNING

The Study proposes construction at 24 different areas encompassing over 54 miles of shoreline. Of these projects, 11 are already existing or approved and 13 are new. These include:

Project Name	Project Type	Project Status
Pompano\Lauderdale by the Sea	5.3 Mile Renourishment	Authorized Project
Fort Lauderdale	2.1 Mile Renourishment	New Project
Port Everglades	0.18 Mile Sand Transfer	New Project
Port Everglades	Spur and Breakwater	New Project
John U. Lloyd	2.3 Mile Renourishment	Authorized Project
Dania Beach	0.6 Mile Renourishment	New Project
Hollywood\Hallandale	5.3 Mile Renourishment	Authorized Project
Golden Beach	1.1 Mile Renourishment	New Project
Sunny Isles	2.5 Mile Renourishment	Authorized Project
Bakers Haulover Inlet	0.08 Mile Sand Transfer	New Project
Bal Harbour, Surfside, Miami Beach	8.9 Mile Renourishment	Authorized Project
Government Cut	0.19 Jetty Tightening	New Project
Key Biscayne	3.2 Mile Renourishment	Authorized Project
Jupiter Inlet	0.13 Mile Sand Trap	New Project
Jupiter\Juno Beach	3.0 Mile Renourishment	Authorized Project
Riviera Beach	0.38 mile Groin or Breakwater	New Project
Riviera Beach	1.7 Mile Dune	New Project
Lake Worth Inlet	0.57 Mile Sand Transfer	New Project
Palm Beach Island	5.6 Mile Renourishment	Authorized Project
So. Lake Worth Inlet	0.25 Mile Sand Transfer	New Project
Ocean Ridge	1.46 Mile Renourishment	Authorized Project
Delray Beach	2.65 Mile Renourishment	Authorized Project
Highland Beach	3.2 Mile Renourishment	New Project
Boca Raton	1.45 Mile Renourishment	Authorized Project

Projects include inlet bypassing, new and old beach renourishment, sand tightening, spur and breakwaters, etc. Due to the enormity of area to cover and the variability in projects, field work for environmental surveys needs to be developed and an Environmental Study Plan developed for the entire Coast of Florida, Region III. The Service needs to be provided with the opportunity to conduct reconnaissance visits to each study area in order to develop the Environmental Study Plan. The uniqueness of each project needs to be recognized and may require special design requirements specific to the area, impacts and the timing of the project. This approach has the advantage of resulting in more timely reports due to changes in environmental conditions over time.

RECOMMENDATIONS

The Service recommends the following be included in future project planning to clearly identify habitat resources and minimize project impacts. It is impossible to predict what methodologies will be required for all potential biological characterizations since the possible varieties of communities are diverse.

1. Service and Corps biologists/divers jointly develop an Environmental Study Plan for Coast of Florida, Region III.

2. The latitude and longitude of all corners of the borrow area, the percent silt and clay at each boring location, and a chart showing the location of all reefs within a mile of the borrow area should be provided to the Service.

3. The Service should be notified of the Corps' intention to propose a SOW at least 6 months prior to preparation of the first draft of the SOW. This will enable the Service to make a preparatory visit to the project area and to assist the Corps in developing a biologically sound study plan suited for that area.

4. During the six month preparatory period mentioned in #3 above, the Service should be funded for not only preparation of the SOW, but also to obtain aerial photographs showing the ocean bottom seaward of the fill area or any nearshore dredge area.

5. At a minimum, the SOW should read that the Draft FWCA Report is due 90 days after the Service receives all project information with Final FWCA due 30 days prior to distribution of the Final EIS. The 90 day timeframe should include spring and summer diving seasons (May through September). As some SCUBA diving is possible in winter, an extended Fall\Winter review period may be acceptable in Region III which is prone to favorable diving conditions.

Field investigations are necessary to locate potential resources at risk. The goal is to not simply generate species lists, but to evaluate impacts to affected organisms and interpret potential habitat responses. It is important to monitor both pre- and post-project conditions in order to evaluate project impacts and to develop adequate mitigation plans if necessary. Fish and Wildlife Service field studies should include the following:

1. video transects perpendicular to the shore every 500 feet or every 1/2 Florida Department of Environmental Protection (FDEP) monument;

2. video transects parallel to the shoreline every 50' seaward to identify vulnerable habitat. The location and lengths of transects will be determined by aerials and reconnaissance visits;

3. photographic quadrates may be needed if seagrasses, corals, worm rock or other sensitive species are present; and,

4. depth recording transects to identify topographic features with significant relief.

ENDANGERED SPECIES

The Service will continue to conduct consultation for threatened and endangered sea turtles under Section 7 of the Endangered Species Act. All sea turtle nesting data available through the FDEP should be added to the Corps' GIS database. The information should be updated annually. This will allow the Corps to provide the Service with sea turtle nesting data on short notice, streamlining the Section 7 Consultation process to threatened and endangered sea turtles.

SUMMARY

The Corps of Engineers has proposed 13 new projects as a result of the Coast of Florida Study, Region III. The Corps provided a SOW for Service involvement in the review of the new projects as well as 11 previously authorized projects. No suggested method for assessing environmental impacts to 54 miles of South Florida Shoreline has been agreed upon by the Corps, Service or Project Sponsor.

The Service has proposed that a contractor survey affected habitat with underwater video which could interface with the Corps and Service GIS systems. This method was deemed too costly by the Corps. Without knowledge of the potential environmental consequences of the newly proposed beach and inlet projects, the Service cannot render a judgement on the advisability of implementing those projects. No new projects should be initiated until adequate biological surveys (assessments) are accomplished to evaluate mitigation needs and associated project costs.

The Service has provided the Corps with this Interim Fish and Wildlife Coordination Act Report which outlines Scoping needs for adequate biological surveys. If future SOW's are to be contracted, the consulting firm and SOW should first be approved by the Service in accordance with our National Transfer Fund Agreement.

Thank you for the opportunity to provide this input. Please contact Mr. Charles Sultzman at 407-562-3909 if you have any questions.

Sincerely,

David L. Ferrell
Field Supervisor

December 22, 1993

Planning Division
Environmental Branch

Mr. Alexander Stone
Director, Project Reefkeeper
2809 Bird Avenue, Suite 162
Miami, Florida 33133

Dear Mr. Stone:

This is in response to your October 15, 1993 letter concerning the Coast of Florida Study (COFS). As requested, your organization has been added to the COFS mailing list. The draft feasibility report and environmental impact statement will be available in October 1994 for public review and comment. We will ensure that you receive a copy.

The hardbottom communities offshore of Region III (Dade Broward, and Palm Beach Counties) have been surveyed and mapped using side scan sonar. At this time only general physical descriptors have been used to define reef types (i.e. high/low relief, patch reef, artificial reef, etc.) based on interpretation of the side scan data. Some groundtruthing was performed during this past fall and more is planned for the spring and summer of 1994. We will BE working with the U.S. Fish and Wildlife Service and the Florida Department of Environmental Protection to develop habitat quality descriptors/indices for hardbottom communities. This work will begin early in 1994. Any information you would like to provide that would help us in this effort will be appreciated.

Sincerely,

A. J. Salem
Chief, Planning Division

Project ReefKeeper

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Operations Center
October 15, 1993

Mr. Mitch Granat
Army Corps of Engineers
Jacksonville District
P.O. Box 4970 -- CESAJ-PD-PC
Jacksonville, FL 32232-0019

re.: Coast of Florida Study

Dear Mr. Granat:

We are a non profit organization dedicated to the conservation of coral reefs in the United States and internationally. We have been involved in beach renourishment environmental issues for years. In the past we were included in the Coast of Florida Study and attended working group meetings as a non-government organization observer. We intend to continue to be involved in the Coast of Florida Study via pre-draft comments and input, and would like to once again be placed on the mailing list for the **Update Report**, and for working group meeting notices.

We would also like to know what the Army Corps of Engineers is specifically using as descriptor definitions for hardbottom and as quality indices for hardbottom quality. If you have not gotten that far, please inform us who will be developing the definitions and quality indices for hardbottom, so that we may provide input.

Sincerely,

Alexander Stone

ALEXANDER STONE
Director

Project ReefKeeper

Fact Sheet

Description

- a membership organization dedicated to worldwide coral reef conservation via policy analysis, public information, advocacy and grassroots organization
- an affiliate of the American Littoral Society, a non-profit marine conservation organization founded in 1961.

Objectives

- to achieve and foster worldwide protection of coral habitats and preservation of their biological diversity

Priority Issue Areas

- offshore oil impacts and contamination
- dredging and siltation impacts
- marine pollution impacts from land-based sources
- depletion of reef fish populations
- creation of coral reef habitat preserves

Current Campaigns

- creation of coral reef protected areas — Texas, Florida, Hawaii, Puerto Rico, Japan, Thailand, Jamaica, USVI
- offshore oil leasing exclusions for coral reef areas — Florida Straits. Gulf of Mexico, U.S. Caribbean
- wire mesh fish trap ban — Florida, Texas USVI, Micronesia.
- coral habitat protection from dredging and beach renourishment smothering — Florida, Hawaii, St. Lucia
- coral collection prohibition — Pto. Rico, USVI, Jamaica, Malaysia, Thailand
- nutrient pollution reduction — Florida, Pto. Rico, Hawaii
- live rock collection ban — Fla., USVI, Hawaii, Pto. Rico

Publications

- ReefKeeper Report

Project ReefKeeper

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December 6, 1993

Planning Division
Environmental Branch

Mr. David L. Ferrell
U.S. Fish and Wildlife Service
P.O. Box 2676
Vero Beach, Florida 32961-2676

Dear Mr. Ferrell:

The Region III portion of the Florida Erosion and Storm Effects Study (Dade, Broward, and Palm Beach Counties) is in its final year of study. The draft feasibility report is scheduled for transmittal to the U.S. Army Corps of Engineers, South Atlantic Division Office in June 1994. We have scheduled a plan formulation technical review conference (TRC) for December 14, 1993 to review the study efforts to date and to discuss alternative plans that are under consideration.

The enclosed provides additional information related to the TRC. You and your staff are invited to attend this conference. The meeting will begin at 0800 in room 104 at the Prime F. Osborn Convention Center, 1000 Waters Street. An agenda and a list of probable attendees are included in the enclosed packet.

I look forward to seeing you at the conference.

Sincerely,

A. J. Salem
Chief, Planning Division

Enclosures

August 10, 1993

Planning Division
Environmental Branch

Mr. David L. Ferrell
Field Supervisor
U.S. Fish and Wildlife Service
P.O. Box 2676
Vero Beach, Florida 32961-2676

Dear Mr. Ferrell:

Enclosed is a Scope of Work (SOW) and Cost Estimate for your office's participation in ground truthing hardbottom/reef communities mapped by side scan sonar surveys within Region III of the Coast of Florida Erosion and Storm Effects Study. Other agencies that will be involved in this effort will be the Florida Department of Environmental Protection and possibly Palm Beach, Broward and Dade Counties. We plan to use the Survey Boat Sable, which has differential GPS navigation, as a dive boat and have tentatively scheduled the field work for the last two weeks in September.

Please sign the enclosed SOW, providing a copy to this office, and process the enclosed MIPR. We request that you expedite processing the MIPR so that we can obligate funds this fiscal year. If you have any questions concerning this, please feel free to contact Mr. Mike Dupes at 904-232-1689.

Sincerely,

Mann G. Davis
Acting Chief, Planning Division

Enclosures

United States Department of the Interior
FISH AND WILDLIFE SERVICE
P.O. BOX 2676
VERO BEACH, FLORIDA 32961-2676

January 8, 1993

Colonel Terrence Salt
District Engineer
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019

Att: Planning Division

RE: Coast of Florida Study

Dear Colonel Salt:

In accordance with the Fiscal Year 1992 Transfer Fund Agreement between the U.S. Fish and Wildlife Service (Service) and the Jacksonville District Corps of Engineers (Corps), this represents a Technical Assistance Report on a method for characterizing the physical attributes of reefs offshore of Dade, Broward, and Palm Beach Counties (Region III) for the Coast of Florida Study. The method involves gathering high resolution digital depth recordings of distinct reef sub areas. The recordings, thus obtained, would then be manipulated mathematically to derive an index of the relative rugosity (ruggedness) of the hard substrate. Increasing rugosity is believed to increase habitat value by offering increasingly numerous hiding places for fishes and invertebrates and by increasing surface area for the attachment of sessile organisms.

The method may also be used to estimate reef height from the surrounding bottom and could be refined to discriminate between rugosity and that resulting from large scale features such as cliffs and boulders resulting from small scale features as rock rubble. This report will first discuss collection of the depth profile data, then will discuss the treatment of those data.

INTRODUCTION

Reef rugosity for small areas has been measured in some studies by forcing a chain (Risk, 1972; Carpenter, et. al., 1981) or a rope (Luckhurst and Luckhurst, 1978) to conform to the irregularities of the reef surface. As a result, the straight-line distance between ends of the chain becomes shortened. The more sinuous the path over the reef surface, the greater the reduction in straight line distance from end to end. This shortening has been treated mathematically in different ways by different researchers. Risk (1972) generated values for "T" (topographic complexity) and Carpenter (1981) used values of "SR" (substrate rugosity). All researchers have found that whatever the resulting term, reefs with more complex, rugged surfaces are inhabited by more fish species and invertebrates.

reefs with more complex, rugged surfaces are inhabited by more fish species and invertebrates.

A similar method can be applied to large areas in measuring reef surface rugosity for the Coast of Florida Study. A depth recorder produces a line which conforms approximately to the shape of reef surfaces. North-south and east-west depth recording transects could be run on reef areas mapped by side scan sonar (This was done by Continental Shelf Associates for Region III). The ratio of the straight-line distance to the over-all distance of the convoluted line of the recording could then be used as an index of ruggedness, surface area, and height of relief ("T" and "SR" have been found to be highly correlated with reef height). This index would, in turn, could be used as an indicator of reef habitat quality.

DATA COLLECTION

Ideally, the equipment used should be able to detect features which are one inch or greater in diameter. Reef surface convolutions of this size could contribute significant surface area and cover for small motile species. As we will explain later, this resolution may not be obtainable with equipment currently available on the market.

Transducers for depth recorders are selected for their beam angle. Wider beam angles (typically 20°) are chosen to search larger areas for fish. Beams of smaller angles cover a narrower swath but give a more detailed representation of bottom features. For the purposes of this study, a high resolution profile of the bottom is desired. Therefore, a transducer with the narrowest beam angle obtainable should be used. To the best of our knowledge, this would be the 1° beam of Odom Hydrographic System's "Echotrac" depth recorder (See enclosed letter, Odom Hydrographics, May 12, 1989).

The subject system has been said to be capable of detecting changes in bottom contours as small as 8 millimeters (.3 inches). However, this claim probably refers to detection of uniform changes in shallow water. Over a depth distance of 10 feet, a beam with angle of 1° would spread to .17 feet (10 sin 1°) or approximately 2 inches. Therefore, a reef feature of 1 inch diameter falling within this sonic cone would not completely fill the detection area. As the return signal would be reflected first by higher objects within the cone, smaller features can be obscured. The resolution capability of this system would, however, yield much valuable information about the presence and frequency of features 2 inches in diameter or greater.

The increase in beam width with distance traveled (i.e., increasing depth) reduces resolution. It would be necessary, therefore, to maintain as constant a transducer height above to bottom as possible. In addition, when a transducer is mounted on the transom of a boat, wave action distortion of bottom bathymetry by alternately increasing and decreasing the effective depth. Both of these difficulties can be surmounted by decoupling the transducer from the boat. With the transducer mounted on a towed, submerged vehicle (see enclosure), transducer height can be held at a constant short distance and, if towed with an elastic cable, short wave distortion can be virtually eliminated.

Boat speed over the bottom, chart paper speed, and sonic pulses per second would have to be held constant throughout the recording. These details can easily be worked out by a qualified marine surveyor.

DATA INTERPRETATION

A. A Simple System

Once a chart recording is obtained for a particular reef area, each transect can then be analyzed for rugosity simply by dividing total length of the convoluted line delineating the bottom into the length of paper used during that transect. For example, in Figure 1, two possible tracings are shown. Figure 1.a. depicts a relatively smooth surface; figure 1.b.depicts a very rugged one. This difference can be quantified by comparing ratios of line length AB ÷ CD and lengths EF ÷ GH. Suppose the paper used during both transects (lengths AB and EF) is 10 inches and the smooth reef generated a line (CD) of length 12 inches, the rugged reef produced a recorded line (GH) of 18 inches. The ratio for Figure 1.a. would be 10/12 or .83; for Figure 1.b. it is 10/18 or .55.

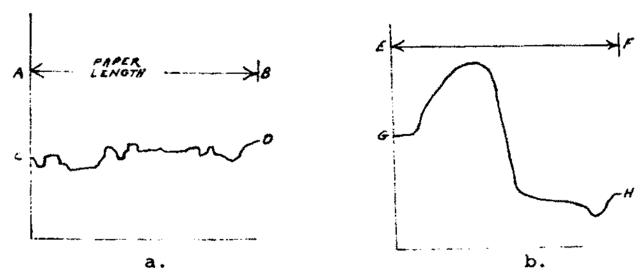

Figure 1. Hypothetical Depth Recordings.

This result could lead to confusion because the less rugged surface has produced a larger fraction. To make the result more comprehensible, these ratios should be subtracted from 1 to yield an index which increases with increasing rugosity. Finally, then, the index for recording 1.a. would be 1 - .83 or .17; that for recording 1.b. would be 1 - .55 or 0.45.

This also makes sense at the extremes of the indexing system. Look at Figure 1.a.. As the sea floor becomes flatter, the index (1-AB/CD) tends toward 0 because AB/CD tends toward unity. Conversely, as the surface becomes increasingly complex, the index tends toward 1 because CD $\rightarrow \infty$ and AB/CD $\rightarrow$ 0. Note however that the index can never = 1, but approaches 1 asymptotically.

All that is needed for this simple system to be made workable is a means by which to measure the length of the line produced by the depth recorder. If the depth data are gathered in digitized form or can be precisely digitized from a chart recording, calculation of the length of the convoluted line should be a fairly simple matter. This aspect is currently being explored by the Fish and Wildlife Service.

B. A Better System

The above method does not discriminate among reef features of different scales. Large scale features such as boulders and cliffs would have habitat value for larger fishes and invertebrates while features of smaller scale such as solution holes and cracks would be equally valuable but for smaller organisms. The methods of fractile geometry allow one to distinguish between topographic complexity attributable to small scale features versus large scale features.

Consider Figure 1 again. The bottom depicted by tracing 1.a. has been calculated to have rugosity index equal to 0.17 while that of tracing 1.b. is 0.45. According to this system, 1.b. is nearly 3 times better than 1.a.. This ignores the fact that 1.a. has numerous small crevices which may be just as important to small species and juveniles for cover as the large cliff in 1.b. is to large fishes and invertebrates.

To make up for this shortcoming, the lines can be measured using methods of increasing resolution. Computer programs are available which automatically perform this analysis (Shelberg, et. al., 1982; Kennedy and Lin, 1986). For the sake of this discussion, the process can be most readily understood by comparing the analysis to repeated measurement of the line by walking a pair of dividers along it. At each measurement, the spacing between ends of the dividers is decreased, thereby increasing the resolution of the measurement.

With dividers widely spaced, only the most prominent features are detected. The presence of prominent features results in a lengthening of the recorded line over the distance from end to end. Figure 2 shows the measurements of the 10 inch depth recordings from Figure 1 after being measured by a pair of dividers spread 2 inches apart (coarse resolution). Only the large hump and sharp drop off of 2.b. are detected. This lengthens the distance traversed to 16 inches. Virtually no increase over 10 inches was required to traverse the depth profile of Figure 1.a. at this level of resolution.

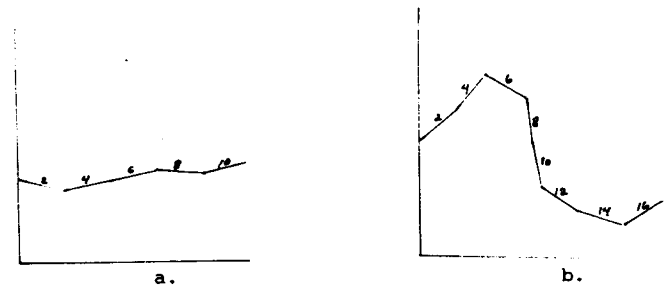

Figure 2. Depth Recordings measurements in 2" increments.

The rugosity index of topographic complexity due to large features for Figure 2.a. is 0, (1 - 10/10). The rugosity index for large features as derived from Figure 2.b. is .375. If the lines are then measured with the highest resolution possible (as in the preceding section) in very small increments, say .001 inches, an approximation of the actual length results. Recall that for Figure 1.a. the resulting index for the 12 inch recorded profile was .17 and in Figure 1.b. the result was a line of 18 inches and index equal to .45. Table 1 below organizes this information more clearly.

Table 1. Rugosity indices at coarse and fine resolution.

Transect	Coarse	Fine	Total
1	0.000	0.17	0.17
2	0.375	0.075	0.45

The above results give a more complete description of the reef areas depicted in Figure 1. One can see that the vast majority of the features on the reef of transect 1 are small features while in transect 2, most of the rugosity is due to large features. By subtracting the rugosity index detected at coarse resolution from that detected at fine resolution, ruggedness due to small features in transect 2 can be approximated. That is, some of the total rugosity of each is also due to small scale features. For transect 2, this would be 0.075, (0.45 - 0.375) or approximately 16.6%.

RECOMMENDATIONS

The application of fractal geometry to depth recording technology would result in the creation of a system capable of estimating surface area and rugosity of large reef areas. Considering the vast area encompassed by the Coast of Florida Study, remote sensing and automated data analysis would be the most cost effective means to evaluate physical attributes of reef habitat. While the use of fractal geometry is more technical and would require more effort to develop a program which would produce the kind of results illustrated in the example above, additional expense would be incurred one time - in the start-up. Once a program is written which will accept digital depth recordings, perform the mathematics, and print the results, no additional expense over a simpler system would be required for operation.

In our opinion, the potential benefits out weigh this expense. As already mentioned, there are programs available which perform most of the functions described in this report. We have enclosed a copy of a paper by Shelberg, et. al. (1986) which presents one such program. As of 1982, Mark Shelberg was employed by the Defense Mapping Agency of the Federal Government. He may be available to assist the Corps and the Service in developing a custom program which will best address our needs for the Coast of Florida Study.

Sincerely Yours,

David L. Ferrell

David L. Ferrell
Field Supervisor

Literature Cited

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Risk, Michael J. 1972. Fish diversity on a coral reef in the Virgin Islands. Atoll Research Bulletin No. 153. Smithsonian Institution, Wash. D. C.

Shelberg, Mark C., Harold Moellering, and Nina Lam. 1982. Measuring the fractal dimensions of empirical cartographic curves. Proceedings: Autocarto V. Washington D. C. pp.481-490.

MEASURING THE FRACTAL DIMENSIONS OF EMPIRICAL CARTOGRAPHIC CURVES

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Abstract

The fractal dimension of a curve is a measure of its geometric complexity and can be any non-integer value between 1 and 2 depending upon the curve's level of complexity. This paper discusses an algorithm, which simulates walking a pair of dividers along a curve, used to calculate the fractal dimensions of curves. It also discusses the choice of chord length and the number of solution steps used in computing fracticality. Results demonstrate the algorithm to be stable and that a curve's fractal dimension can be closely approximated. Potential applications for this technique include a new means for curvilinear data compression, description of planimetric feature boundary texture for improved realism in scene generation and possible two-dimensional extension for description of surface feature textures.

INTRODUCTION

The problem of describing the forms of curves has vexed researchers over the years. For example, a coastline is neither straight, nor circular, nor elliptic and therefore Euclidean lines cannot adquately describe most real world linear features. Imagine attempting to describe the boundaries of clouds or outlines of complicated coastlines in terms of classical geometry. An intriguing concept proposed by Mandelbrot (1967, 1977) is to use fractals to fill the void caused by the absence of suitable geometric representations. A fractal characterizes curves and surfaces in terms of their complexity by treating dimension as a continuum. Normally, dimension is an integer number (1 for curves, 2 for areas, and 3 for volumes); however, fractal dimensions may vary anywhere between 1 and 2 for a curve and 2 and 3 for a surface depending upon the irregularity of the form. Although individual fractals have been around since the 1900's, Mandelbrot was the first to recognize their applications outside of mathematics.

This paper discusses an algorithm, written in an interactive setting, designed to measure the fracticality of a curve and additions to theory. It also presents results from examining several cartographic curves.

DEFINITION OF FRACTALS AND SELF-SIMILARITY

In Euclidean geometry every curve has a dimension of 1 and every plane has a dimension of 2. This is generally referred to as the topological dimension (Dt). These dimensions remain constant no matter how complex or irregular a curve or plane may be. For example, the west coast of Great Britain contains many irregularities, but the topological dimension remains 1.

In the fractal domain a curve's dimension may be between 1 and 2 according to its complexity. The more contorted a straight line becomes, the higher its fractal dimension. Similarly, a plane's dimension may be a non-integer value between 2 and 3. The fractal dimension for any curve or surface is denoted by (D) and within this framework: $D \geq Dt$. Mandelbrot (1977) proposes the following definition for a fractal: "A fractal will be defined as a set for which the Hausdorff-Besicovitch dimension strictly exceeds the topological dimension." The precise definition of the Hausdorff-Besicovitch dimension can be found in Besicovitch and Ursell (1937).

Central to the concept of fractals is the notion of self-similarity. Self-similarity means that for any curve or surface a portion of the curve or surface can be considered a reduced image of the whole. However, seldom in nature (crystals are one exception) does self-similarity occur and therefore a statistical form of self-similarity is often encountered. In other words, if a curve or surface is examined at any scale it will resemble the whole in a statistical sense; therfore, D will remain constant. Brownian motion is an excellent example of statistical self-similarity. Because of this principle, a curve can be decomposed into $N=r$ nonoverlapping parts and each subsegment has a length of $1/r=1/N$. Similarly, a unit square can be divided into $N=r^2$ squares, where the similarity ratio is $r(N) = 1/r = 1/N^{\frac{1}{2}}$. In either case the following equation applies:

$$D = \log N / \log (1/r) \tag{1}$$

and could be called the shape's similarity dimension. D can also be expressed as:

$$D = \log (N/N_0) / \log (\lambda_0/\lambda) \tag{2}$$

where λ_0 and λ are two sampling intervals and N_0 and N are the number of such intervals contained. If a curve resembles a straight line then when the sampling interval is halved, N doubles and the proportion equals 1. The majority of cartographic curves are not straight lines and therefore N will more than double causing D to be greater than 1. The principle of self-similarity is dismissed by Goodchild (1980), Hakanson (1978), and Scheidegger (1970). Hakanson, for example, points out the absurdity of postulating the validity of self-similarity down to the size of the pebbles on the coastline and at the molecular interstices of those pebbles. Goodchild demonstrates that although Richardson (1961) found the west coast of Britian to have a constant D of 1.25 over sampling intervals between 10 and 1000km., he found the east coast to vary between 1.15 and 1.31 for a similar sampling interval. This suggests that whatever created the irregularities on the coastline acted at specific scales. Goodchild states that since self-similarity is only one aspect of the fractal approach, it would be unwise to reject the entire concept.

DEVELOPMENT OF THE FRACTAL CURVE ALGORITHM AND EXTENSION OF THEORY

The following original algorithm is based on the earlier empirical work performed by Richardson (1961) and later extended by Mandelbrot (1967). Richardson measured the lengths of several frontiers by manually walking a pair of dividers along the outline so as to count the number of steps. The opening of the dividers (n) was fixed in advance and a fractional side was estimated at the end of the walk. The main purpose in this section of Richardson's research was to study the broad variation of Σn with n.

Richardson produced a scatterplot in which he plotted log total length against log step size for five land frontiers and a circle. Mandelbrot (1967) discovered a relationship between the slope (β) of the lines and fractal dimension (D). To Richardson the slope had no theoritical meaning, but to Mandelbrot it could be used as an estimate of 1-D, which leads to:

$$D = 1 - \beta \qquad (3)$$

The algorithm simulates walking a pair of dividers along a curve and counts the number of steps. In cases where more than one intersection occurs, the intersection which comes first in order forward along the curve is selected. To be more accurate, step size (prescribed opening of the dividers) is called chord length (cl) and the number of steps is called the number of chord lengths.

In order to begin walking the dividers along the curve, the dividers must be set to some opening. The curves used in this research are not infinitely subdivided fractal curves so that selection of the initial chord length must be based on some attribute of the curve. For a very contorted curve it would be meaningless to choose a chord length many times shorter than the shortest line segment. If an extremely short chord length is selected, an attempt to examine the fractal character of a curve would extend beyond the primitive subelements used to represent the geometry of the resulting form. In other words, beyond this lower limit of primitive subelements, the curve's fractal dimension behaves as if it is a straight line. A suggested initial chord length is determined by calculating the distance between each two consecutive points on the curve and taking 1/2 the average distance. The average distance is divided by 2 because the sampling theorem states one should sample at 1/2 the wavelength so that no significant variation escapes. This presents an approximate lower limit as to the selection of the initial chord length. Although the accuracy of this method is dependent on the manner in which the curve is digitized, the form of the curve often dictates this manner.

After the initial chord length is determined, the algorithm computes the distance between the first two points on the curve using the standard distance formula. If the distance is greater than chord length (cl), a new point is interpolated between points 1 and 2 using the following interpolation equations:

$$DP = (cl - DIST1) / (DIST1 - DISTA) \qquad (4)$$

$$XNEW = X_1 + DP * (X_2 - X_1) \qquad (5)$$

$$YNEW = Y_1 + DP * (Y_2 - Y_1) \qquad (6)$$

where DP = distance proportion

DIST1 = distance between the present point and the first forward point on the curve

DISTA = distance between the present point and the second forward point on the curve

XNEW = new X- coordinate
YNEW = new Y- coordinate
X,Y = X and Y coordinates of point 1 and 2.

Figure 1 demonstrates how a point is interpolated on a straight line segment.

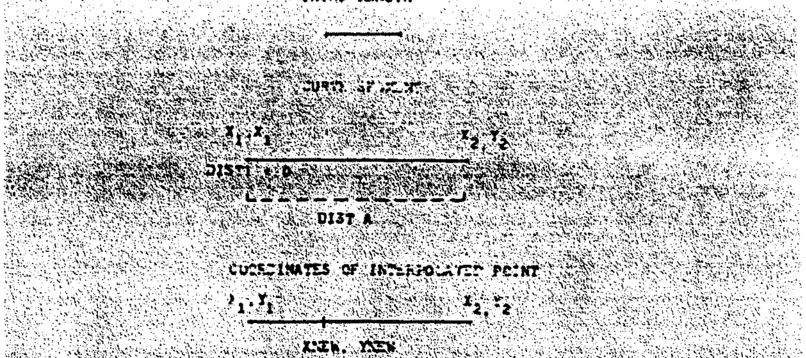

Figure 1. Interpolating on a straight line segment.

If the distance is less than the chord length, the distance between points 1 and 3 (DISTC) is computed. If DISTC is greater than the chord length, it is known that the chord length segment intersects between points 2 and 3 and that the distance between these points is determined (DISTB); See Figure 2a.

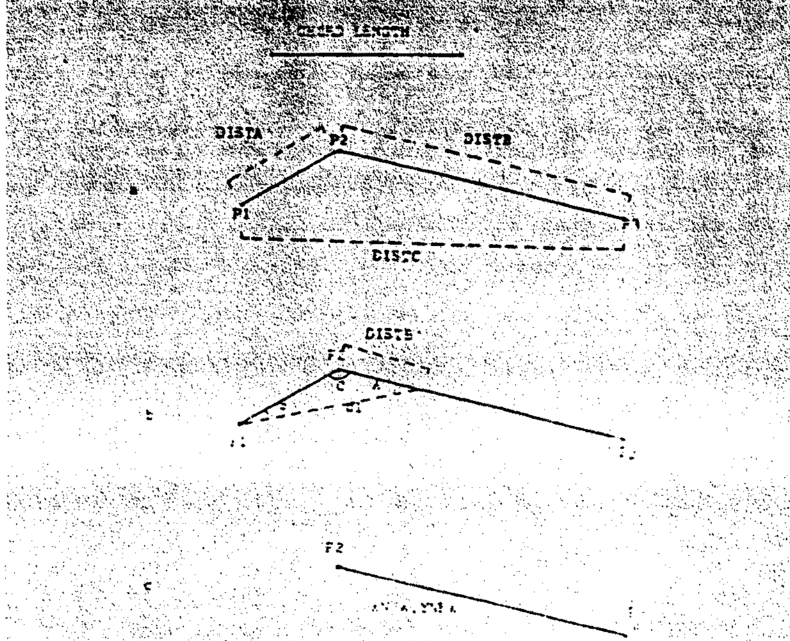

Figure 2. Three point interpolation.

The point of intersection is computed using trigonometric functions. An angle C is determined using the law of cosines.

$$C = \cos^{-1} \frac{DISTB^2 + DISTA^2 - DISTC^2}{2 * DISTB * DISTA} \tag{7}$$

Since angle C is known, an angle A, which is the angle the chord length intersects between points 2 and 3, can be computed.

$$A = SIN^{-1} ((DISTA * \sin C)/cl) \tag{8}$$

Now that two angles are known, angle B is easily computed. Because angles A and B are known, a side (DISTB') can be calculated; see Figure 2b.

$$DISTB' = (DISTA * \sin B)/\sin A \tag{9}$$

DISTB' provides the distance, from point 2, in which the chord length's intersection is located on the segment between points 2 and 3. A distance proportion is calculated using:

$$DP = DISTB'/DISTB \tag{10}$$

Since the distance proportion and the X,Y coordinates for points 2 and 3 are known, the equations used to interpolate for a straight line segment can be used to determine the new coordinates: see Figure 2c. After the new point is located, this new point becomes point 1 and the next two forward points on the curve become points 2 and 3. Each time a chord length's intersection is determined, 1 is added to the number of chord lengths.

In the case where DISTC is less than the chord length, the third point is incremented by 1 (fourth point) and the distance again checked. This continues until the distance is greater than the chord length or the end of the curve is encountered; see Figure 3.

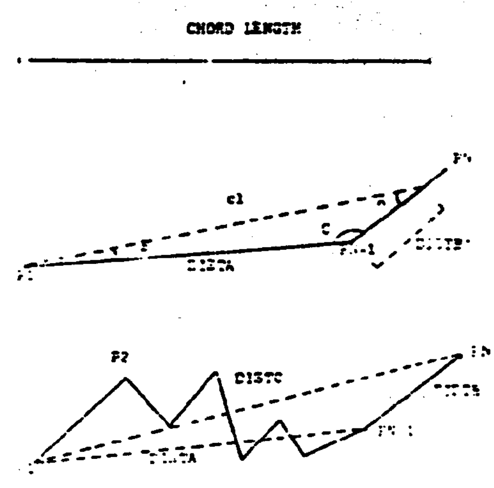

Figure 3. More than three point interpolation.

When the distance does become greater than the chord length, the chord length's point of intersection is determined by using the same trigonometric equations as discussed above. The only difference is the sides of the triangles may be longer. At the end of the curve, if the chord length is greater than DISTA, the portion of the remaining chord length is added to the number of chord lengths.

After the dividers are walked along the curve with the initial chord length, the dividers are opened to another distance. This distance is a geometric adding of the first chord length. For example, if the initial chord length is 2, then the subsequent chord lengths would be 4, 8, 16, 32, 64, and so on. This eliminates biasing when using linear regression because on a logarithmic scale, geometric adding provides equal spacing between the chord lengths.

The number of solution steps or the number of times the dividers, with different chord lengths, are walked along the curve is limited by the number of chord lengths used to estimate length. The minimum number of chord lengths used to approximate length is 5. This is chosen to provide consistency among results as opposed to using a variable limit, but is subject to change pending additional research.

After each time the dividers are walked along the curve, the number of chord lengths and the corresponding chord lengths are saved. These are used in the linear regression where log line length (number of chord lengths *chord length) is regressed against log chord length. A curve's fractal dimension is determined by using equation 3.

To provide an indication of the proportion of variance in the response variable explained by the describing variable, r^2 is computed. This value plays an important role in determining the optimum number of solution steps. A low r^2, for example when the number of solution steps equals 12, means the initial chord length falls below the primitive subelements. A low r^2 is determined by decreasing the number of solution steps and comparing the two values. The desirable number of solution steps is indicated when r^2 reaches its maximum without the number of steps falling below 5. A linear regression with less than 5 points opens up some criticisms as to the validity of results and it should be emphasized the linear regression is used as a parameter estimate and not for statistical inferences.

EXAMPLES AND RESULTS

Of the five land-frontiers Richardson measured, four have been point digitized and used in this study. They are: coast of the Australian mainland; coast of South Africa, starting from Swakopmund to Cape Sta. Lucia; frontier between Spain and Portugal, moving south to north; and the west coast of Great Britain, from Land's End to Duncansby Head. Table 1 shows D as the result of Richardson's measurements and the new D suggested by this research. The expected discrepancy is the result of the digitization process because digitization allows the capture of minute detail in a curve, and since these curves were digitized at a larger scale, a higher D is anticipated.

Curve	Slope (B)	D (1-B)	New D
West Coast of Great Britain	-.25	1.25	1.2671
Coast of Australia	-.13	1.13	1.1490
Coast of South Africa	-.02	1.02	1.0356
Land-frontier between Spain and Portugal	-.14	1.14	1.1014

Table 1. Result from Richardson's (1961) research, corresponding fractal dimension and the new suggested fractal dimension.

For this paper, Kodiak Island is used to demonstrate how the fractal curve algorithm operates. The curve was digitized in trace mode with delta minimum and delta maximum variations at .002 and .05 respectively. The outline contains 1653 points and is in Figure 4.

Figure 4. Kodiak Island with 1653 points where the fractal dimension equals 1.3105.

The results from calculating D are in Table 2 where the different initial chord lengths are selected to show the possible variations in D over a number of sampling intervals. The results show D to vary from 1.1836 to 1.3714. These variations in D reflect a lack of self-similarity in the curve.

Initial Chord Length	D	R-SQ	No. of Solution Steps
.00400	1.1836	.827614	10
* .01833	1.2619	.916728	8
** .03666	1.3025	.954146	7
.05894	1.3105	.976810	6
.07500	1.3466	.964087	6
.08000	1.3660	.972126	6
.10000	1.3714	.975220	5

*Suggested initial chord length
**Average segment length

TABLE 2.
Kodiak Island at 1:1,000,000 with 1653 points

The selection of an extremely short initial chord length of .01833 represents examining the curve below its primitive subelements and biases D toward a straight line. The corresponding scatterplot in Figure 5 displays a curvature of the data points resulting in a lower R-SQ.

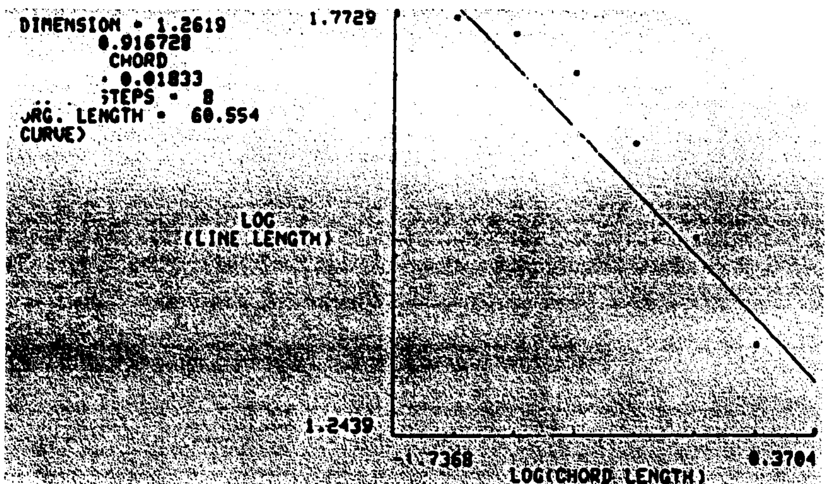

Figure 5. Scatterplot for Kodiak Island (1653 points) where the initial chord length equals .01833.

It is this type of curvature, resembling the shape of a rainbow, that indicates the shortness of the chord length. The chord length of .01833 is the average segment length and is calculated by computing the distance between each two consecutive points on the curve, summing the distances, and dividing by the number of segments. The suggested D to represent the curve is 1.3105. The most appropriate D value is determined from the minimum amount of curvature present in the scatterplot resulting in the relatively high R-SQ value. The suggested initial chord length of .03666 is still too small, indicated by the low R-SQ value, but represents a starting point at which to determine D.

A thinned version of Kodiak Island is in Figure 6 and contains 1000 points.

Figure 6. Kodiak Island with 1000 points where the fractal dimension equals 1.2949.

The elimination of 653 points is accomplished with a program which deletes excessive points within a certain chord length. Table 3 indicates D varying between 1.214 and 1.3659.

Initial Chord Length	D	R-SQ	No. of Solution Steps
.00700	1.1778	.861745	9
.00800	1.2144	.867113	9
* .02947	1.2558	.942722	7
** .05894	1.2949	.974398	6
.10000	1.3659	.971356	5

*Suggested initial chord length
**Average segment length

TABLE 3.
Kodiak Island at 1:1,000,000 with 1000 points

The comparison between the same chord length of .05894 for the original and thinned islands displays how stable the algorithm is to measure D. This initial chord length produced a D of 1.3105 (1653 points) and 1.2949 (1000 points) giving a 1.19% difference. The D for the 1000 point island is expected to be slightly lower because any data thinning process normally removes some complexity from the feature. The proposed D for the thinned island is approximately 1.2949 and the scatterplot is in Figure 7.

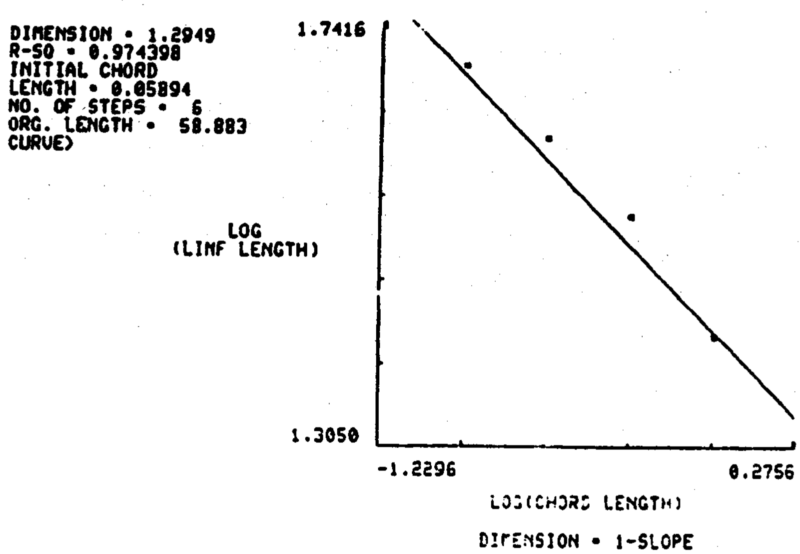

Figure 7. Scatterplot for Kodiak Island (1000 points) where the initial chord length equals .05894.

SUMMARY AND CONCLUSIONS

The results based on the previous empirical curves point out the importance of selecting the appropriate initial chord length. A chord length which is too short is easily detected by either examining the amount of curvature present in the scatterplot or the low R-SQ value. Normally, the suggested initial chord length falls within this category, but it must be emphasized that this chord length is merely a beginning point. The ideal initial chord length, which produces the most appropriate D, is selected by observing the behavior of the scatterplots, R-SQ values, and the number of solution steps. This research, like Richardson's work, indicates that from 5 to 8 solution steps are sufficient to determine the slope of the regression line and thus fracticality.

The results also indicate the fractal curve algorithm to be stable, and that it is able to closely approximate D. The variations in D, over a number of sampling intervals, reflect a need to examine the effects of self-similarity, or lack of it on a curve's fracticality. Finally, this research brings into focus the strong problem solving capabilities, at the hands of cartographers, through the use of interactive computer graphics.

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May 12, 1989

Mr. Chuck Sultzman
U.S. Fish and Wildlife Service
P.O. Box 2676
Vero Beach, FL. 32961

15 Rec'd

Dear Mr. Sultzman:

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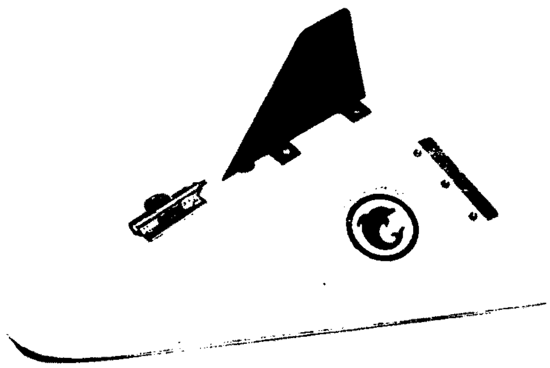

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